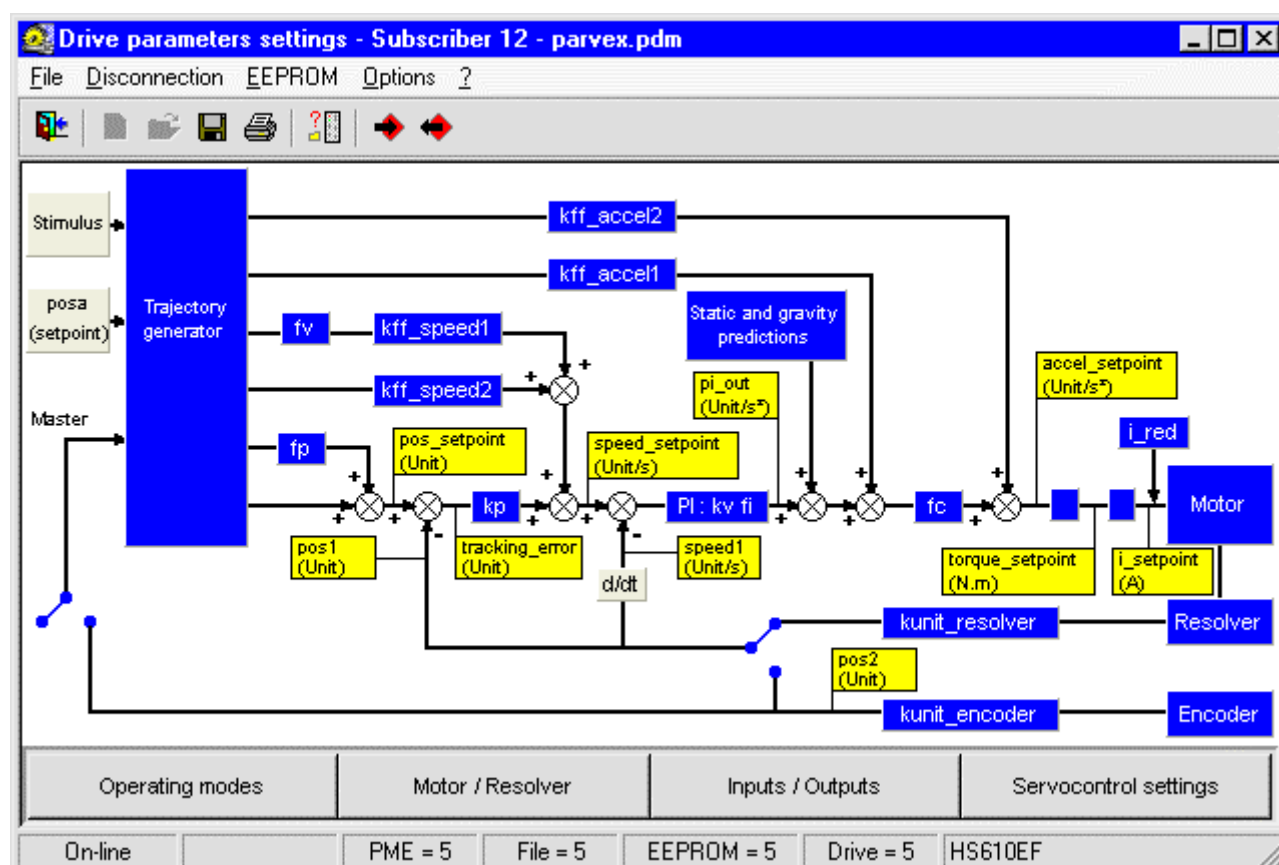


SOFTWARE

PME - DIGIVEX Motion

Adjustment Manual

PVD 3516 GB – 04/2004



PRODUCT RANGE

1 - « BRUSHLESS » SERVODRIVES

TORQUE OR POWER RANGES

- **BRUSHLESS SERVOMOTORS, LOW INERTIA, WITH RESOLVER**
 Very high torque/inertia ratio (high dynamic performance machinery):
 ⇒ NX -HX - HXA 1 to 320 N.m
 ⇒ NX - LX 0,45 to 64 N.m
 High rotor inertia for better inertia load matching:
 ⇒ HS - LS 3,3 to 31 N.m
 Varied geometrical choice :
 ⇒ short motors range HS - LS 3,3 to 31 N.m
 ⇒ or small diameter motors : HD, LD 9 to 100 N.m
 Voltages to suit different mains supplies :
 ⇒ 230V three-phase for «série L - NX»
 ⇒ 400V, 460V three-phase for «série H - NX»
- **"DIGIVEX DRIVE" DIGITAL SERVOAMPLIFIERS**
 ⇒ SINGLE-AXIS DSD
 ⇒ COMPACT SINGLE-AXIS DμD, DLD
 ⇒ POWER SINGLE-AXIS DPD
 ⇒ MULTIPLE-AXIS DMD
- **"PARVEX MOTION EXPLORER" ADJUSTING SOFTWARE**

2 - SPINDLE DRIVES

- **SPINDLE SYNCHRONOUS MOTORS**
 - ⇒ "HV" COMPACT SERIES
 - ⇒ "HW" ELECTROSPINDLE, frameless, water-cooled motor
 - **"DIGIVEX" DIGITAL SERVOAMPLIFIERS**
- From 5 to 110 kW
up to 60,000 rpm

3 - DC SERVODRIVES

- **"AXEM", "RS" SERIES SERVOMOTORS** 0.08 to 13 N.m
- **"RTS" SERVOAMPLIFIERS**
- **"RTE" SERVOAMPLIFIERS** for DC motors + resolver giving position measurement

4 - SPECIAL ADAPTATION SERVODRIVES

- **"EX" SERVOMOTORS** for explosive atmosphere
- **"AXL" COMPACT SERIES SERVOREDUCTORS** 5 to 700 N.m

5 - POSITIONING SYSTEMS

- **Numerical Controls « CYBER 4000 »** 1 to 4 axes
- **"CYBER 2000" NC** 1 to 2 axes
- **DRIVE - POSITIONER**
 - ⇒ SINGLE-AXIS DSM
 - ⇒ POWER SINGLE-AXIS DPM
 - ⇒ MULTIPLE-AXIS DMM
- **ADJUSTMENT AND PROGRAMMING SOFTWARE** PARVEX MOTION EXPLORER

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Characteristics and dimensions may change without prior notification.

YOUR LOCAL REPRESENTATIVE

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1. OVERVIEW

1.1 Summary of other DIGIVEX Motion Manuals

◆ DIGIVEX Single Motion (DSM) User Manual	(DSM)	PVD3515
◆ DIGIVEX Power Motion (DPM) User Manual	(DPM)	PVD3522
◆ DIGIVEX Multi Motion (DMM) User Manual	(DMM)	PVD3523
◆ DIGIVEX Motion - CANopen		PVD3518
◆ DIGIVEX Motion - Profibus		PVD3554
◆ PME-DIGIVEX Motion Adjustment Manual		PVD3516
◆ DIGIVEX Motion Directory of Variables		PVD3527
◆ DIGIVEX Motion Programming		PVD3517
◆ DIGIVEX Motion - Cam Function		PVD3538
◆ PME Tool kit User and Commissioning Manual		PVD3528
◆ CANopen - CAN Bus Access via CIM03		PVD3533
◆ CANopen - Remote control using PDO messages		PVD3543
◆ "Block Positioning" Application Software		PVD3519
◆ "Fly shear linear cutting" software application		PVD3531
◆ "Rotary blade cutting" software application		PVD3532

1.2 PME DIGIVEX Motion Functions

PME "Parvex Motion Explorer module DIGIVEX Motion" offers a complete software interface for managing PARVEX digital products.

From a Windows® platform, *PME DIGIVEX Motion* allows the user to:

- select a digital product:
 - positioner drives,
 - remote input/output modules [Function currently not available]
 - keyboard – MicroVision display
 - ...
- incorporate this product into a network structure:
 - the various digital components then create an architecture and communicate in network via a CAN or PROFIBUS bus,
 - the entire architecture can then be supervised by a computer equipped either with CAN interface that supports the CANopen protocol or with PROFIBUS-DP interface.
- individually regulate and program each digital component:
 - setting parameter editors,
 - program editors.
- manage the entire created system:
 - access to all available functions,
 - easy maintenance via observation tools and configuration back-up/downloading commands.

A detailed description of each service is given in the following sections.

2. INSTALLATION

2.1 Hardware and Software Set-up

- IBM™ PC office or industrial computer or compatible
- Intel Pentium® processor or equivalent
- Windows® version 98, Millennium, NT 4.0 (service pack 4 or above recommended), 2000 or XP
- VGA colour screen
- 1 parallel port
- 1 or more RS232 serial ports for using DIGIVEX Motion CANopen.
- 1 USB port for using DIGIVEX PROFIBUS with USBPRO interface
- 1 PCI slot for using DIGIVEX PROFIBUS with PCIPRO interface
- 1 PCMCIA slot for using DIGIVEX PROFIBUS with PCMCIAPRO interface
- Colour printer recommended
- Pointing device (mouse, trackball or equivalent)
- Software installation requires 20 to 40 MB hard disc space

Attention :

A printer driver must be installed to provide satisfactory *PME.CYBER* software operation. It is not essential though to physically connect a printer.

An installation utility creates the directories required and implants the system files on your PC hard disc. Required disc space is about 40 MB.

2.2 User's licence

Parvex Motion Explorer PME software is licensed.

The terms and conditions for using Parvex Motion Explorer software can be consulted during or after installation by displaying the contents of the Licence.F text file in the pme directory.

PME software is available on CD-ROM.

Users are authorised to make a back-up copy (internal use only). This copy shall under no circumstances be transferred, given away, rented, sold or installed at a third party's.

Enter the license number supplied with the original CD-ROM when installing the software. This number must be quoted on any correspondence concerning the product.

2.3 Installation - Operating Mode

The Parvex Motion Explorer installation program creates the necessary folders and recopies the files on to your computer using an information carrier.

How to install the program from a CD-ROM:

- Start up your PC.
- Under Windows®, insert the CD-ROM in the CD-ROM player.
- An "*auto run*" program begins automatically after several seconds.
- Follow the instructions for installing the program.

If the "*auto run*" program does not start up:

- Click on "*Start*", then select "*Settings*" and "*Control Panel*".
- Double click on the "*Add / Remove programs*" icon.
- Select the "*Install / Uninstall*" tab.
- Click on "*Install*": Windows® automatically searches for the executable program, then asks the user to start "*setup.exe*".

Uninstalling:

- Back-up any files that you wish to keep.
 - Click on "*Start*", then select "*Settings*" and "*Control Panel*".
 - Double click on the "*Add / Remove programs*" icon ".
 - Select the "*Install / Uninstall*" tab, followed by "*Parvex Motion Explorer*".
 - Click on "*Add / Remove*" in order to start up the deletion program.
- Follow the instructions on the screen. All files from the Parvex Motion Explorer software will be deleted. Only the user files located under the Parvex\Program Files\App_User\ directory and the database file that deals with specific motors will be preserved.

3. PME IMPLEMENTATION

3.1 Preliminaries

Parvex Motion Explorer provides a complete software interface for DIGIVEX Motion positioner drive implementation.

Certain functions are only accessible when the positioner drives are on and working.

System Start-Up:

- Switch ON the system using the main switch.
- Check that the auxiliary supply reaches the positioner drive. Do not apply power. In normal operation [no events], the 7-segment display on the front panel shows a **blinking 0** (steady 0 if a user program is open). The red *POWER OFF* LED is lit.
- For DIGIVEX CANopen, check that the supply for the CRS232 interface module is present. *This module* is supplied by the positioner drive(s). A green LED light (located next to the CRS232 module 9-pin SUB-D socket) is used to check the status of the power supply to the card.
- For DIGIVEX PROFIBUS, it is the PC that supplies the USBPRO interface. Green and red LED on the USB, side light up and flash as the interface is initialized at the beginning of a network structure search; only the red LED then stays on.

3.2 Starting the application

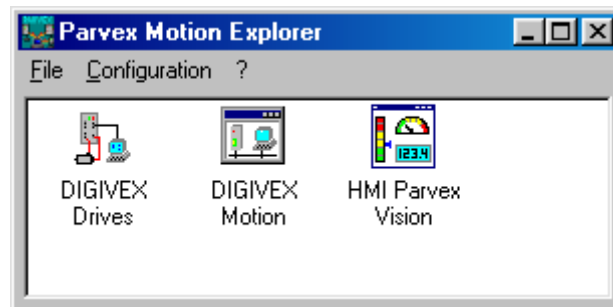
Double-click on the *PARVEX PME* icon located on the desktop in order to open the *PARVEX Motion Explorer* control panel (or select: *Start, Programs, Parvex, Parvex Motion Explorer*).

PARVEX PME Icon:



3.3 Control Panel

PARVEX Motion Explorer Control Panel:



The *DIGIVEX Motion* tab is associated with the positioner drive of the DIGIVEX Motion family.

3.3.1 File

File

Exit

Closes all open sessions.

3.3.2 Configuration

Select Language

Configuration

Language

Check ☒ the desired language:

☒

Français

English

Español

Deutsch

The selected language is applied to the *Parvex Motion Explorer* control panel and all open modules.

3.3.3 Programs

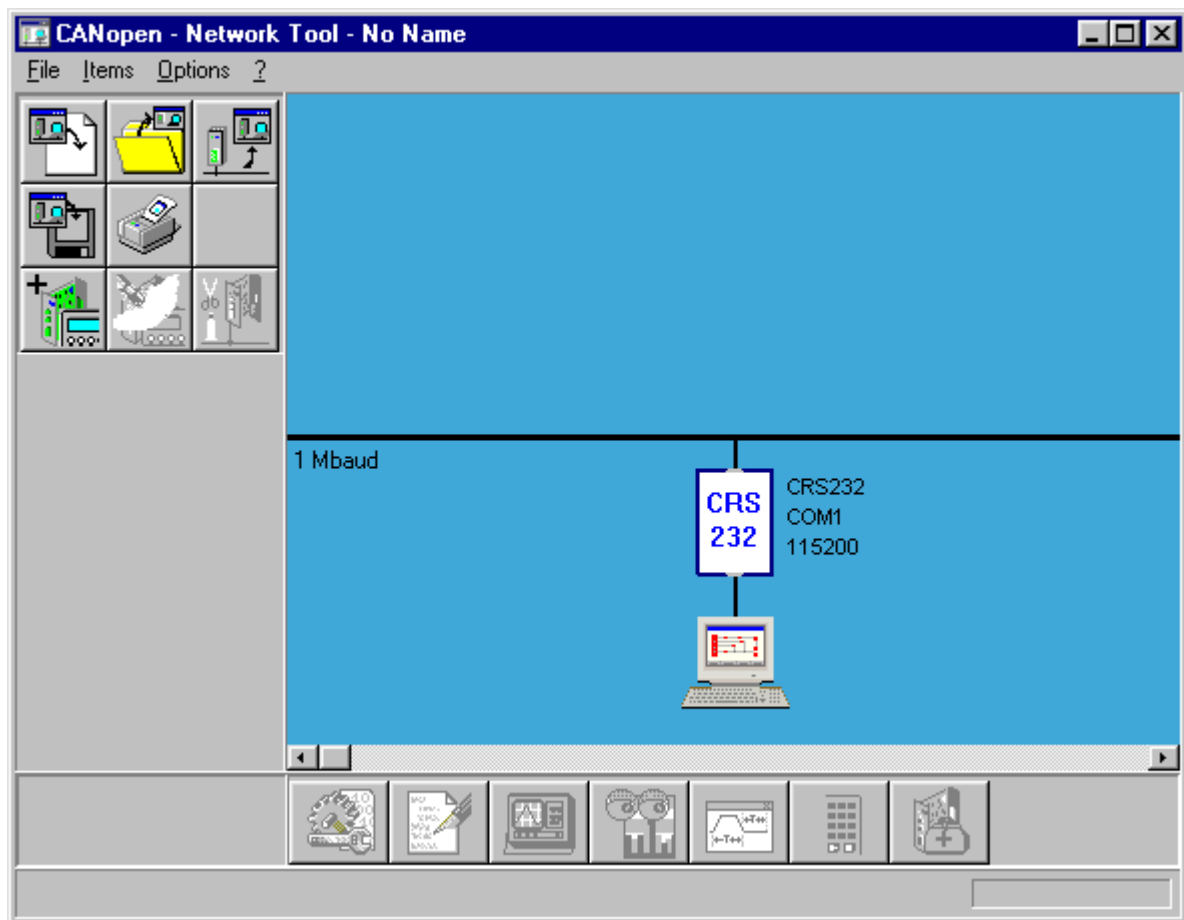
Programs

DIGIVEX Motion



This command is used to start the PME DIGIVEX Motion module dedicated to applications using drive positioners.

Click on the *DIGIVEX Motion* button to open the following window:

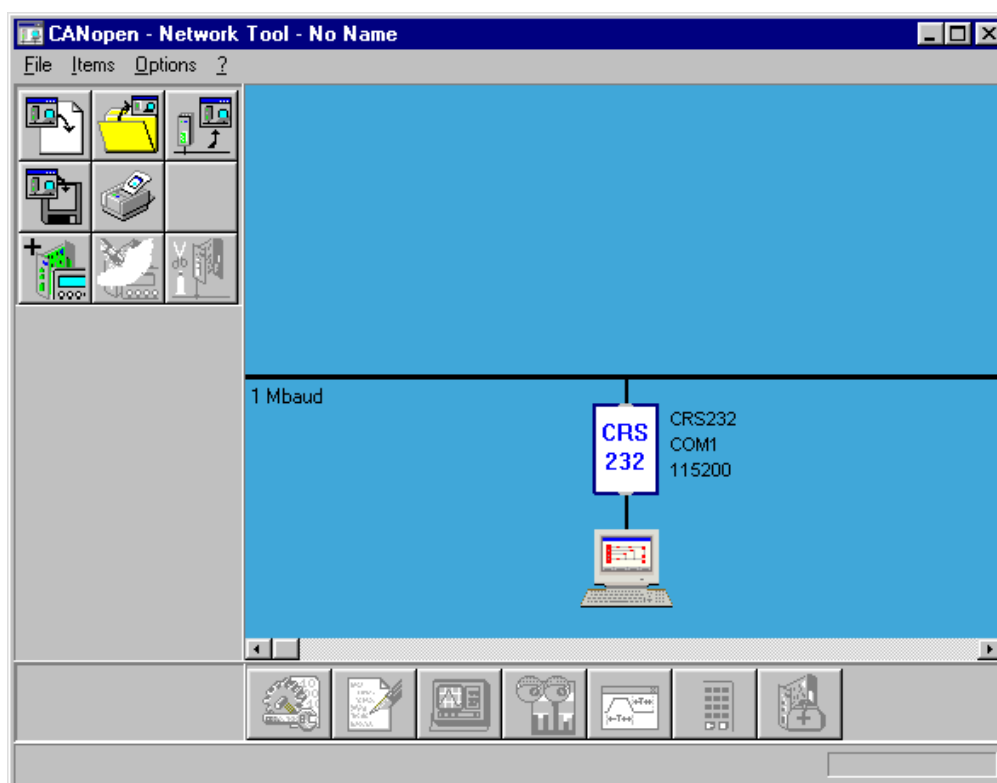


This environment, called *Network Management*, is used to have access to *PME DIGIVEX Motion* functions. A preview of the main functions proposed is given after.

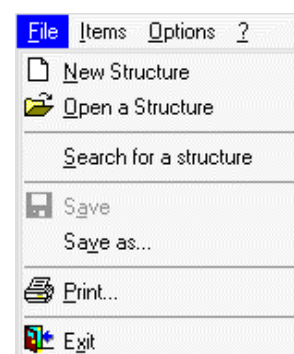
4. COMMUNICATION NETWORK MANAGEMENT

4.1 Network Structure

In the *PME DIGIVEX Motion* context, a *network structure* includes several interconnected elements, called *items*, that communicate via the communication bus (CAN or PROFIBUS).



4.1.1 Creation of a New Structure



This action is carried out by the following control sequence:

File

New Structure



It is useful to create a new *structure* when defining the network structure. At this time, the user can free himself from the material existence of the equipment to be controlled.

The screen is blank. The user creates the structure of his application by adding various *items*.

4.1.2 Adding an Item

Items are added by the following control sequence:

Items

Adding an Item



There are several different types of *items* that can be added:

- *DSM or DMM positioner drives,*
- *DPM positioner drive,*
- *MicroVision Terminal ...*

4.1.3 Removing an Item

Use the mouse, or any other pointing device, to click on the *item* to be removed.
The following control sequence is used to remove an *item*:

Items

Remove the selected Item



4.1.4 Saving the Structure

When a *structure* has just been created, it is advised to save its characteristics in a back-up file.
This operation is carried out using the following control sequence :

File

Save As

Choose the recording medium (floppy disk, hard drive, etc), the archives directory and the back-up file name: *name_structure.top*.

When a *structure* has been previously saved using the *File/Save As* sequence, all new modifications can be saved by the following control sequence:

File

Save



4.1.5 Opening a Structure

A *structure* that has been previously saved can be opened using the following control sequence:

File

Open a Structure



Select the recording medium, the directory and the filename of the *structure* to be opened. The diagram corresponding to the opened *structure* will be displayed on the screen.

4.1.6 Searching for Structures

The software program automatically detects (by quantity and type) which *items* that make up the network *structure* are present and switched ON. The mimic diagram of the existing *structure* is displayed on the screen.

When *items* belonging to the opened *structure* are not detected, a red cross indicates that they are not connected.

The " Searching for Structures" function is accessible by using the following control sequence:

File

Search for a Structure



Attention: The PC interface parameters must be set prior to a structure search (see sections 4.1.9 and 4.1.10)

Disconnecting an Item

An item present in the network can be disconnected by clicking on this item, and then clicking on the following button:



A red cross then indicates that this subscriber is "not connected".

Connecting an Item

The connection for a "non connected" item is located by clicking on this item, and then clicking on the following button:



If the item is located on the network, the red cross disappears and the subscriber is recognized as being present.
If the item is not detected, the red cross does not disappear.

4.1.7 Print

The default printer is defined in the Windows® environment. (Refer to Control Panel.)

Use the following control sequence to print the *structure* displayed on the screen:

File

Print



4.1.8 Exit

To exit the *Network Management* environment, select the following control sequence:

File

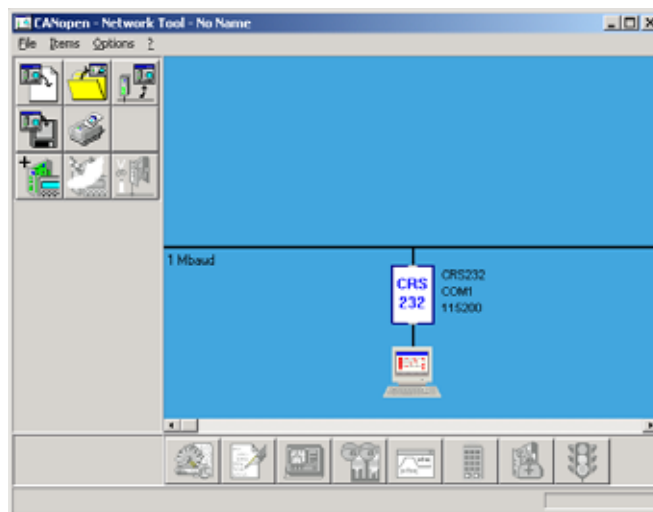
Exit

The *Network Management* window closes.

If the structure was modified, the user will be asked if he wishes to save the modifications in a **.top** file before exiting.

Clicking on the  button has the same effect.

4.1.9 CANopen PC Interface



4.1.9.1 Reset CRS232B/CIM03B



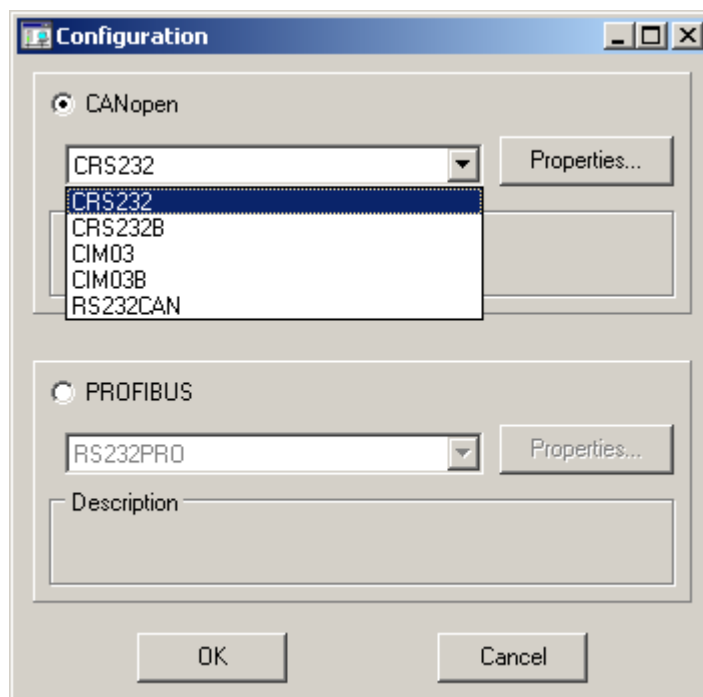
The *Reset* button is pressed to carry out a remote reinitialization of CRS232B and CIM03B interface modules.

This functionality is not available for CRS232 and CIM03 interface modules.

4.1.9.2 Options – Configuration

4.1.9.2.1 Configuration

Options
Configuration



RS232 / CANopen interface Indicates which RS232 / CANopen interface module is used:

- CRS232 module
- CRS232B module
- CIM03 module
- CIM03B module
- RS232CAN module

Properties



Baud Rate Configuration

<i>Serial Port</i>	From the drop-down menu ▼ , select the identifier for the serial port used by your PC.
<i>Baud Rate (transfer rate)</i>	Select the baud rate from the drop-down menu ▼ . (115,200 Bauds is recommended).

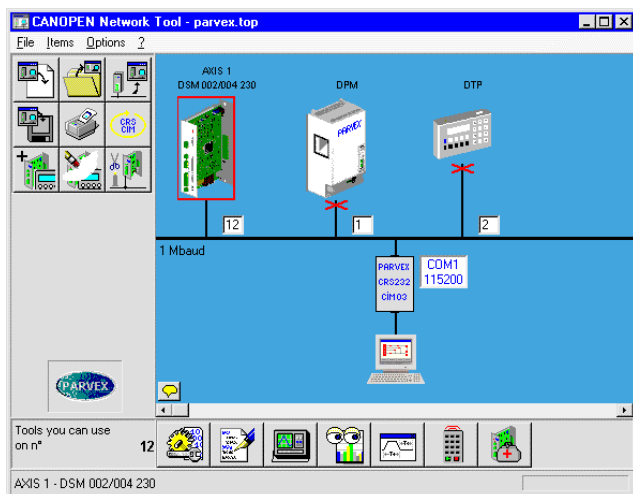
This drop down list is used to select the CAN baud rate for the CRS232 and CIM03 interface modules (in PC mode).

<i>Configuration CAN baud rate</i>	The standard value used by appliances in the DIGIVEX Motion family is 1Mbauds. This value must not be modified without just cause!
------------------------------------	---

Searching subscribers

The search, when searching for all present subscribers, is carried out for all subscribers numbered from 1 to 63. It is possible to limit the search to subscribers numbered from 1 to 31, the most frequent situation, thus, reducing the search time.

4.1.9.3 Example of CANopen structure



In the example opposite, the *structure* includes:

- a computer
- the CRS232 module (interface between the RS232 serial link and the CAN bus)
- a DSM positioner drive (subscriber no.12)
- a DPM power positioner drive (subscriber no.1)
- a μ Vision terminal (subscriber no.2)

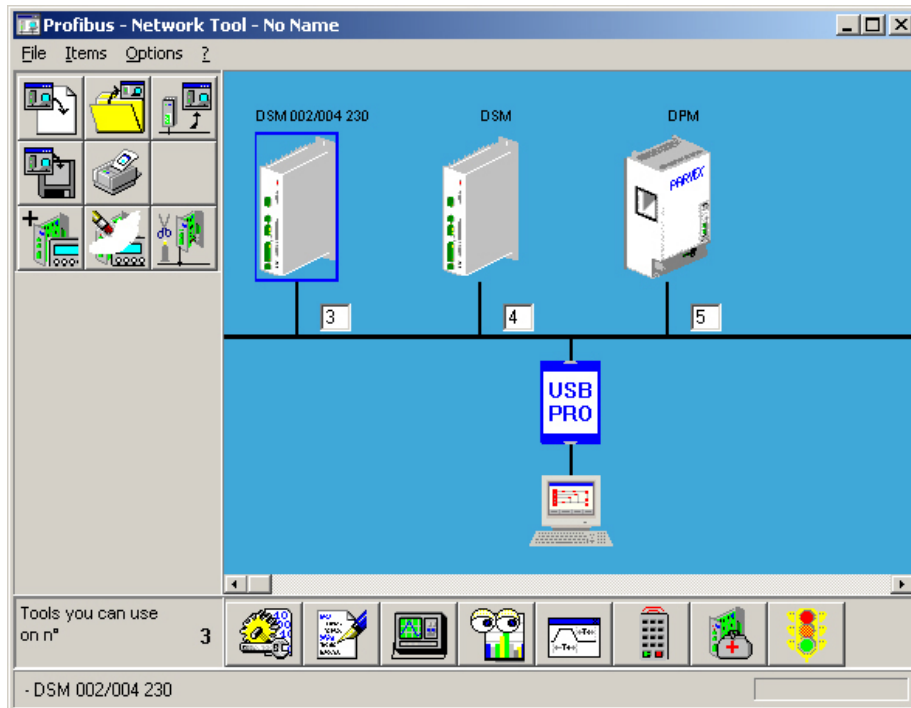
- Actually, only subscriber **no. 12** was detected as belonging to the network. Subscribers *no.1* and *no.2* were not detected: a red cross indicates that they are "not connected".
- By clicking on a subscriber (in this example, subscriber no.12), the tools that can be used for this subscriber are displayed as buttons, in the lower strip of the *Network Management* window. Only coloured buttons are accessible (buttons that cannot be used remain shaded).
- The characteristics pertaining to the selected item are given in the lower, left-hand corner of the screen. Here, subscriber no.12 is a DSM 2/4 A 230 V –type positioner and is named *Axis1*.

4.1.9.4 Changing the CANopen subscriber number

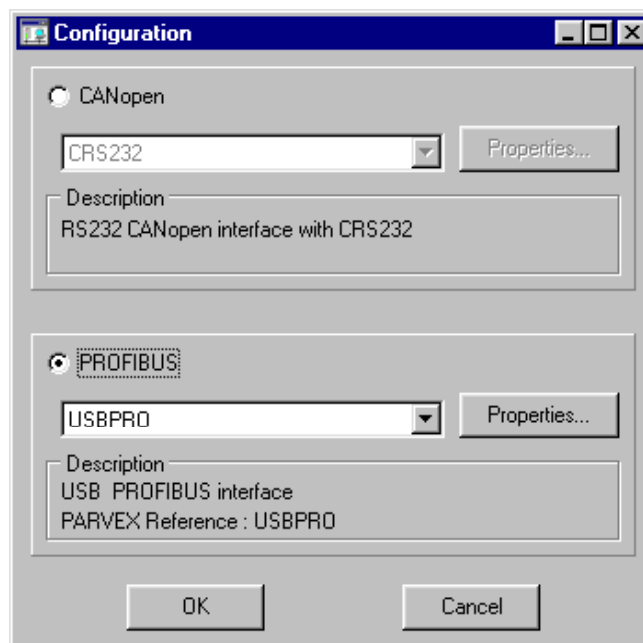
The following window is opened by clicking on the *subscriber number* box located in the trunk node of the *item* with the CAN bus:

<i>Current Number</i>	This cell displays the current subscriber number.
<i>New Number</i>	Enter the new subscriber number in this cell. Check that the device physically connected to the network has itself also been reset with the same number (miniature rotating switch, internal configuration, etc.).
<i>Apply</i>	Click on this button to apply the new subscriber number to the CAN bus.

4.1.10 PROFIBUS PC Interface



Options
Configuration



PROFIBUS Interface

Check "Profibus" and indicate which PROFIBUS interface module is used:

- USBPRO module (max baud rate 5Mbaud)
- CP5611module
- CP5511module
- USBPROx12 module (max baud rate 12Mbaud)

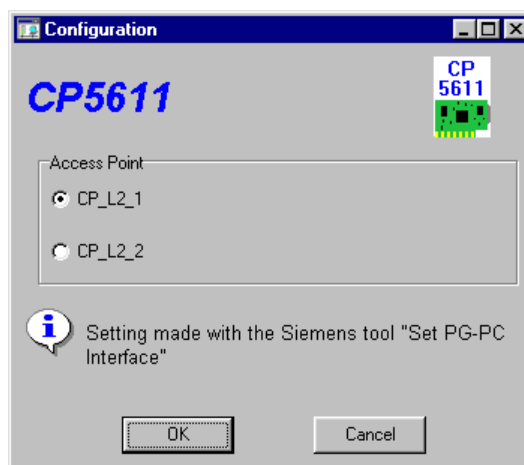
PROFIBUS interfaces are supplied by a third party, please refer to the manufacturer's installation procedures beforehand.

REFERENCE	DESIGNATION
USBPRO or USBPROx12	USB-PROFIBUS Interface
PCIPRO	PCI-PROFIBUS CP5611 Card
PCMCIAPRO	PCMCIA - PROFIBUS CP5511 Card

Properties

CP5611 and CP5511

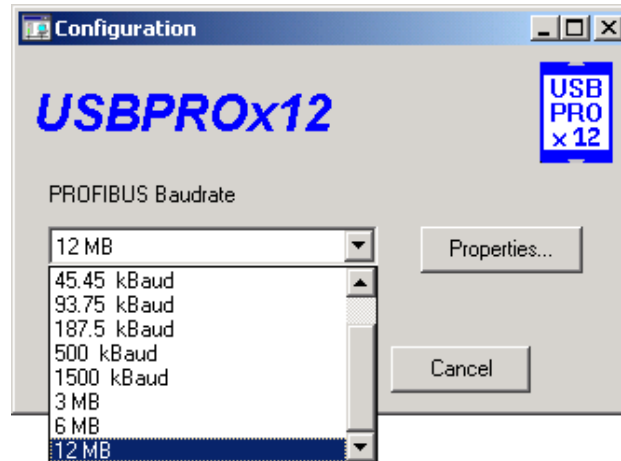
The access point must be selected in accordance with the value selected using the SIEMENS "Set PG-PC interface" parameter setting tool



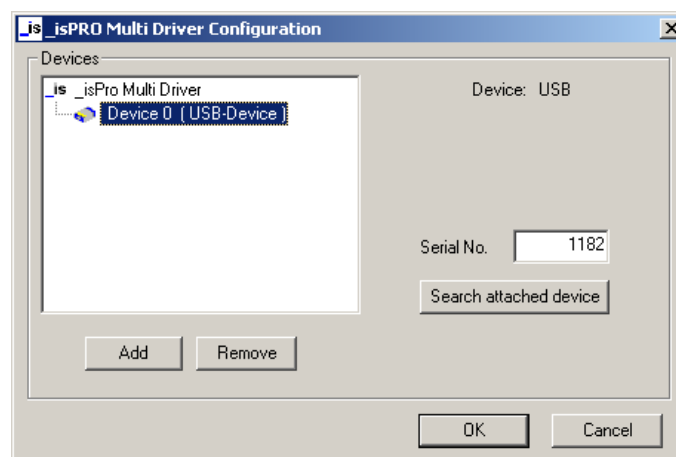
Please refer to "PVD3554 – DIGIVEX Motion – Profibus" for more information

USBPRO and USBPROx12

The Profibus transmission speed will possibly need to be changed so that it matches that imposed by the "Master"



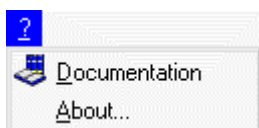
Click on "Properties" to select the serial number for the USB/Profibus interface device. This number is detected automatically by clicking on "Search attached device".



Validate the configuration by clicking on "OK".

Please refer to "PVD3554 – DIGIVEX Motion – Profibus" for further information.

4.1.11 About...



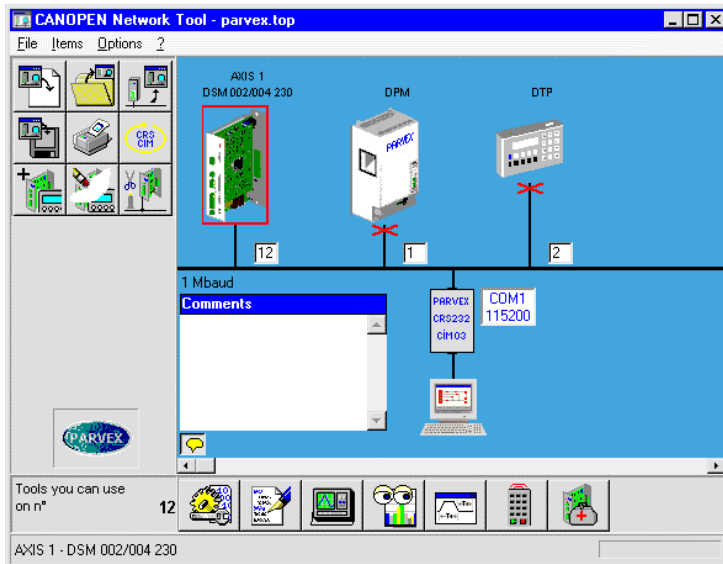
This menu gives access to the:

- PME software guide in Acrobat Reader PDF format
- About... window and displays the version number of the current software

4.1.12 Comments



The *Comments* window is opened by clicking on the "dialog box" button located above the   scroll bars and to the right of the *PARVEX* logo:



This function is used to edit a text that will be saved with the *name_structure.top* file. It contains comments about the *structure* (characteristics, data included, etc.). The comments text is visible when printed (*File / Print* control sequence or corresponding button).

4.1.13 Available Tools

By clicking on a subscriber, the available tools for this subscriber are displayed as buttons in the lower part of the *Network Management* window. The operating mode for each tool is described in a specific section of this notice.

Parameter Setting Tool

Program Editor

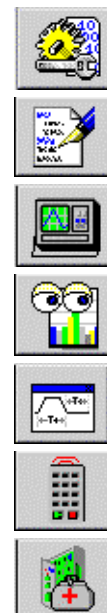
Oscilloscope Tool

Variable Watcher Tool

Stimuli Generator Tool

Execution Control Unit Tool

Diagnostic Help Tool



The latter four tools are used for *items* having been detected as belonging to the network, during a structure search. (Please refer to command *File / Search for a Structure*)

4.2 PC and DIGIVEX Motion memory zones

The various information communicated to the positioner drive such as data, parameters or programs, is stored in distinct memory zones.

The **_DM** extension refers to devices in the **DIGIVEX Motion** family (*DSM, DMM, DPM*).

The **_PC** extension concerns the PC connected to the *CAN* or *PROFIBUS* bus.

4.2.1 EEPROM DM

A non-volatile storage zone, which is called **EEPROM_DM**, contains the machine parameters and the user configuration file.

This memory is physically located on the personalization board of the positioner drive.

A part of the **EEPROM_DM** is integrated with the motherboard of the positioner drive. In particular, it memorizes the operating time of the positioner and its serial number.

4.2.2 RAM DM

When the positioner drive is powered up, or restored (control restore), the contents of the **EEPROM_DM** are transferred to a RAM, which is called **RAM_DM**. This memory is used to exchange data on-line (*ON LINE*) between the positioner and the PC.

4.2.3 FLASH DM

User programs (assembler programs, source programs, cam tables) are located in a flash_eprom – type storage zone, which is called **FLASH_DM**. This memory is located on the personalization board and takes up 512Kb of space.

4.2.4 PROG DM

The executable code contained in the **FLASH_DM** memory is transferred to a RAM called **PROG_DM** (216Kb RAM) at power-up of the positioner drive, or during program application ("Apply programs" command).

User programs found in the **PROG_DM** memory are executed by the positioner drive.

4.2.5 FIRM DM

The operating system software is called *firmware*.

It is located in a flash_eprom –type storage zone, which is called **FIRM_DM**.

4.2.6 RAM PC

When the positioner drive is connected to the PC, an image of its **RAM_DM** is transmitted to the RAM in the PC, which is called **RAM_PC**.

4.2.7 Bulk Storage

Diskettes and hard drives make up the bulk storage unit of the PC. This memory is used to save user data.

5. SETTING DRIVE PARAMETERS

5.1 Presentation

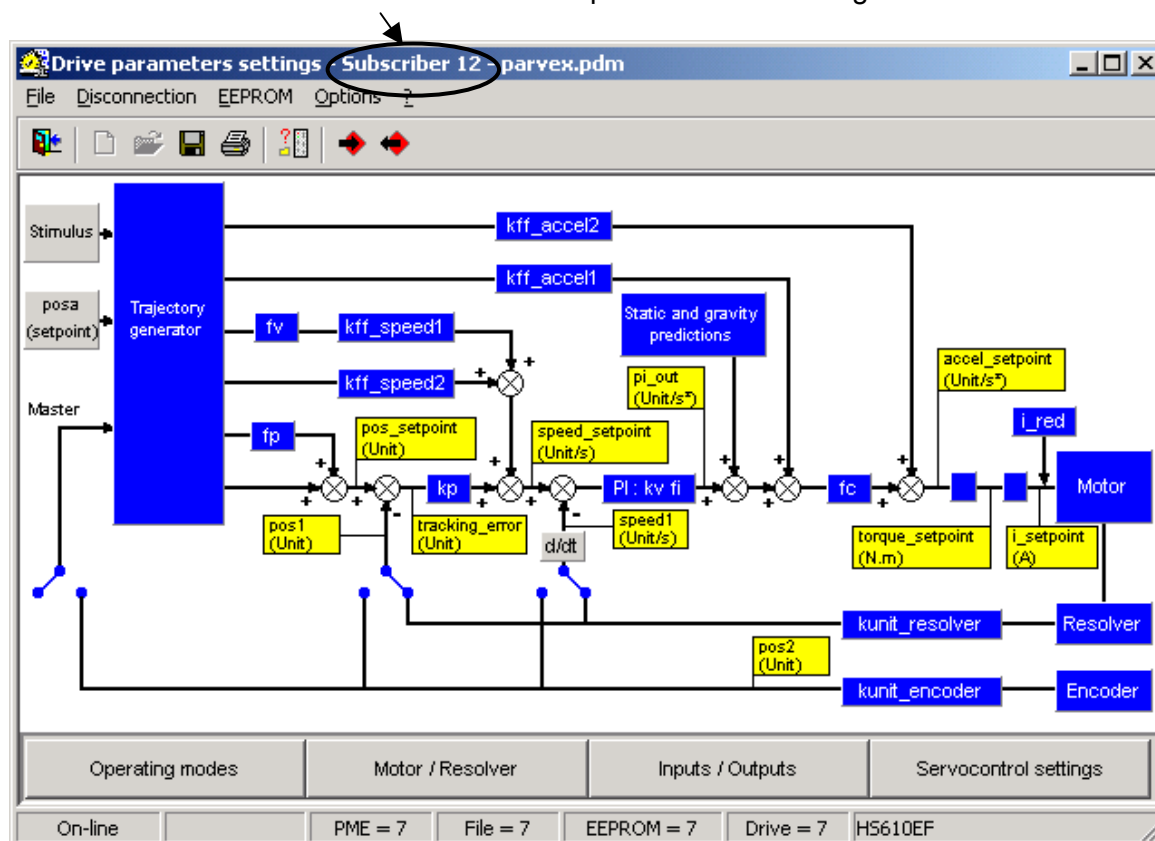
Select the drive to be set by clicking on its pictogram in the *Network Management* environment, and then pressing the *Set Parameters* button:



The *Set Drive Parameters* main window opens:

Parameter setting is carried out drive by drive.

This is the subscriber number of the drive whose parameters are being set



ON LINE status indicates that the motion controller is connected to the PC (it is not connected in *OFF LINE* status).

Data:

- PME = 7 indicates that the parameter editor used can manage the set of parameters 1 to 7
- Drive = 7 indicates that the onboard motion controller software can manage the set of parameters 1 to 7
- File = 7 indicates that the parvex.pdm file contains a level 7 set of parameters
- EEPROM = 7 indicates that the motion controller EEPROM memory contains a level 7 set of parameters

A set of parameters corresponds to the list of parameters recognized and managed by a positioner drive. The level 7 set of parameters is the latest generation (new functionalities available).

5.1.1 Mimic Diagram

It shows the structure of the servocontrol loops integrated on the *DIGIVEX Motion* family products.

The *Trajectory Generator* receives the following input:

- the stimulus *Stimulus*
- the position setpoint *posa (Setpoint)*
- the Master position setpoint *Master*

• and supplies the following output:

- the position setpoint of the controlled movement,
- the position setpoint of the Master movement,
- the speed setpoint of the controlled movement,
- the speed setpoint of the Master movement,
- the acceleration setpoint of the controlled movement,
- the acceleration setpoint of the Master movement.

The position servocontrol uses the return position data sent from the *Resolver* or from the external encoder, called *Encoder*.

The feed forward is called *kp*.

Speed predictions are called *kff_speed1* and *kff_speed2*.

The status of the switches shows how the *Encoder* return position data is used according to the selected operating mode.

The speed servocontrol uses return speed data sent from the *Resolver*.

The fast forward is called *PI: kv fi*.

Acceleration predictions are called *kff_accel1* and *kff_accel2*.

Static and gravity predictions are called *static and gravity predictions*.

The current reduction function is called *i_red*.

The lower part of the main window displays four control buttons:

Operating Modes

Motor / Resolver

Inputs/ Outputs

Servocontrol Settings

Comments regarding all the windows managed by the Parvex Motion Explorer software program:

File

Exit

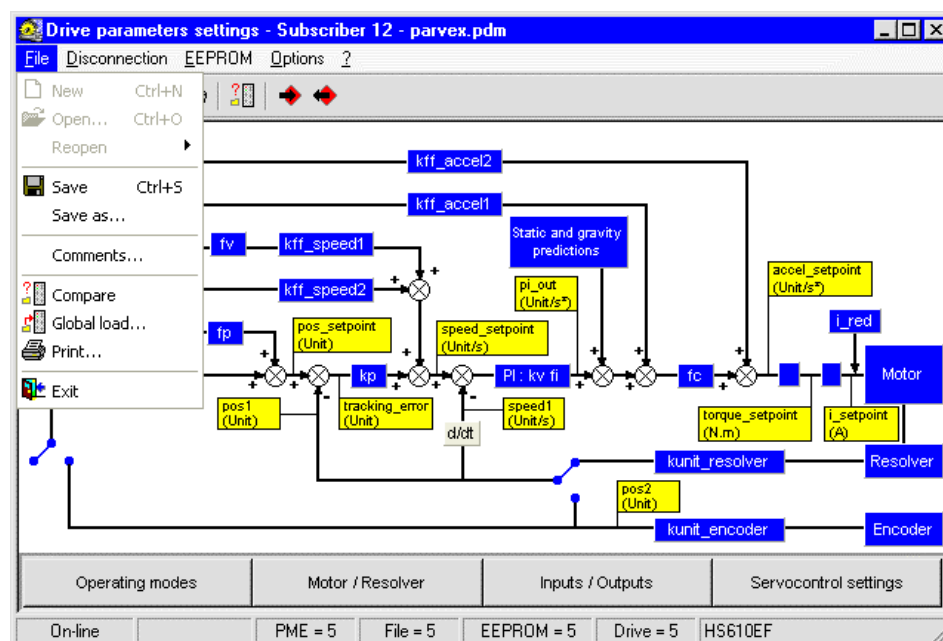


Used to exit the current work session. If any modifications were made during this session, the user will be asked if he wishes to save the parameter modifications in a file before exiting the program. (Save function).

Pressing the button has the same effect.

5.1.2 File

The "File" menu opens the following menu:



File New 	This control sequence initializes a new parameter setting session. It is only available in OFF LINE mode. The entire mimic diagram is at first displayed in red. The various pictograms will turn to blue when the user will have successively selected and validated the menus suggested at the bottom of the <i>Set Drive Parameters</i> window using the following buttons: <i>Operating Modes</i>, <i>Motor / Resolver</i>, <i>Inputs / Outputs</i> and <i>Servocontrol Settings</i>.
File Open 	This control sequence is used to open a parameter file previously saved with a filename having a .pdm extension. This function is only available in OFF LINE mode. The pictograms in the mimic diagram turn to blue.
File Save 	This option is used to save a set of parameters stored in the RAM on the PC onto a floppy disk or hard drive (current work session). Comment: When the status is ON LINE, the contents of the PC's RAM is the image of the positioner's RAM (RAM_DM). The saved parameter file has a .pdm extension.

<i>File</i> Save As	This sequence offers the same possibilities as the previous one, but is used to specify the following information: – the recording medium (floppy disk, hard drive, etc...), – the archives directory, – the .pdm filename. The .pdm extension is suggested by default. Only files having a .pdm extension are recognized by the <i>Open</i> command.
<i>File</i> Comments	 This function allows the user to record his own comments about the application: - operating point corresponding to the current settings, - personalization of the controlled axis, - etc...
Compares Files 	The user can compare the open parameter file (when in OFF line mode) or the motion controller parameters (when in ON line mode) with the contents of another parameter file. A window opens to allow file selection, and then a chart is displayed in which the parameters are compared. A "red" index highlights the presence of different values.
<i>File</i> Global Transfer 	This control sequence is only accessible during <i>ON LINE</i> status. It is used to <i>download</i> all the parameters of a .pdm file to the RAM of a positioner drive (RAM_DM). When the transfer is completed, a message is displayed on the screen asking the user if he wishes to save the <i>filename.pdm</i> in non-volatile memory (EEPROM_DM). - The motor must be at zero torque or without power, for the <i>Global Transfer</i> to be able to be carried out. - The filename of the transferred .pdm file is displayed on the upper strip of the <i>Set Drive Parameters</i> window.
<i>File</i> Print 	Prints the contents of a previously opened parameter file in text format. The default printer is defined in the Windows® environment. (Refer to Control Panel.)
<i>File</i> Exit 	Used to exit the current work session. If any modifications were made during this session, the user will be asked if he wishes to save the parameter modifications in a .pdm file before exiting the program. (Save function).

5.1.3 Connection / Disconnection

The *Connection* control sequence is available only in *OFF LINE* status (drive not connected), while the *Disconnection* control sequence is available only in *ON LINE status* (drive connected).

Connection

This control sequence sends the connection request from the PC to the drive. When the connection is made, the status switches to *ON LINE*. The *Connection* control sequence loads the parameter settings stored in the RAM of the positioner drive (RAM_DM) into the RAM of the PC.

- If a work session was previously opened, it will be replaced. A warning message suggests that the user saves his data, using the *Save As* function, before executing the *Connection* sequence.

Disconnection

This control sequence sends the disconnection request from the PC to the drive. When the disconnection is made, the status switches to *OFF LINE*.

Comments

In *OFF LINE* status, the software program runs the PC memory: hard drive, diskettes, RAM_PC. When a **.pdm** parameter file is opened using the *Open* sequence the color/colour of the pictograms in the mimic diagram changes to blue.

In *ON LINE* status, the software program communicates with the RAM of the drive (RAM_DM). This context is required to operate in real-time on the drive and its environment from the PC. The pictograms in the mimic diagram are blue.

The *ON LINE* / *OFF LINE* status indicator is explicitly displayed in the lower, left-hand corner of the of the *Set Drive Parameters* window.

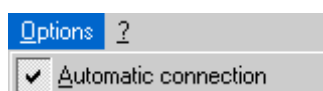
The subscriber number for the drive is shown in the title bar.

5.1.4 EEPROM

This command displays the following alternatives:

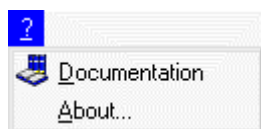
SAVE Save in EEPROM		The SAVE command saves the contents of the RAM_DM into the EEPROM_DM. All data entry windows will be saved at the same time. The SAVE command is not available in <i>OFF LINE</i> status.
RESTORE Restore		The RESTORE command restores the contents of the EEPROM_DM and puts it into the RAM_DM. Comment: At power-up, a RESTORE operation is automatically carried out. The RESTORE command is not available in <i>OFF LINE</i> status.
Upgrade EEPROM		The Upgrade EEPROM instruction allows the version of the set of parameters in the EEPROM_DM memory to be incremented (use of the positioner drive to the maximum of its possibilities): EEPROM set of parameters = Drive set of parameters. This instruction is only of interest, if, initially, EEPROM set of parameters < Drive set of parameters.

5.1.5 Options



Check ☒ the *Automatic connection* cell to request that the PC be connected automatically to the drive, when the parameter setting editor opens.

5.1.6 About...



This menu gives access to the:

- PME software guide (Acrobat Reader PDF format)
- About... window and displays the version number of the current software

5.2 Operating Modes

Click on the *Operating Modes* button to display the following window:

5.2.1 Configuration

This environment is used to define the operating mode that will be applied to the axis.

5.2.1.1 Controlled axis

Axis Name	Enter a suitable name in this field; its name may contain up to 15 characters. [Corresponding Parameter: <i>axis1</i>]
Units	Enter the name of the application unit in this field; its name may contain up to 15 characters, but in general, avoid exceeding 5 characters. [Corresponding Parameter: <i>unit1</i>] This data has absolutely no effect on the settings. It is only used to show the type of unit used to measure or set the positions

5.2.1.2 Position Feedback

<i>By Motor Resolver</i>	By default, the control in position is carried out by the motor resolver. The <i>By Motor Resolver</i> is then selected. [Corresponding Parameter: <i>option_card</i> = 0 or 2]
<i>By External Encoder</i>	By external encoder: Check this cell when the control in position is carried out by an external encoder, which is often attached to the mobile unit to be displaced. This operating mode involves the use of an optional encoder input card. [corresponding parameters: <i>option_card</i> = 1 or 3 and <i>encoder_use</i> = 0] The return speed can be provided by the: • resolver [corresponding parameter: <i>fb_option</i> = 1] only if <i>option_card</i> = 1 (this selection is not possible if <i>option_card</i> = 3: SinCos encoder) • encoder [corresponding parameter: <i>fb_option</i> = 0] (default value)
<i>External Encoder used as Master</i>	When the external encoder is used as a master axis reader, the <i>By Motor Resolver</i> and <i>External Encoder used as Master</i> will be validated. This operating mode implies the use of an optional encoder input board. [Corresponding Parameters: <i>option_card</i> = 1 and <i>encoder_use</i> = 1] In function of the resolution of the external encoder, a filtering qualified as normal or high is offered for reducing the noise on the current control unit of the motor.
<i>Normal Filtering</i>	Used by default when the encoder frequency in lines/s at maximum speed is greater than or equal to 50 kHz. [Corresponding Parameter: <i>filter_type</i> = 0]
<i>High Filtering</i>	Used when the encoder frequency in lines/s at maximum speed is included between 5 kHz and 50 kHz. When this frequency is less than 5 kHz, the application is poorly sized. [Corresponding Parameter: <i>filter_type</i> = 1]

5.2.1.3 Resolver

<i>Units / Motor Revolutions</i>	Enter the correspondence coefficient between the motor revolutions and the displacement units. [Corresponding Parameter: <i>kunit_resolver</i>]
----------------------------------	---

Remark: Additional information is displayed if the position is servocontrolled by an external encoder. It will show the correspondence factor, for the encoder, between encoder revolutions and displacement units [Corresponding parameter: *kunit_encoder*, Inputs / Outputs window, Encoder Input / Output tab].

5.2.1.4 Modulo

Modulo operation consists in bringing the positional value of the controlled axis within a given interval. This is typically used with rotary axes or axes with no physical limits, which move indefinitely in the same direction.

When the user checks ☒ the "Apply the specified modulo" box ☐, the system takes into account the upper and lower limits stated.

Let's take as an example a 360° rotary plate. If the user selects a lower limit of -180° and an upper limit of +180°, the axis position will always be between -180° and +180° whatever the cumulative movements made by the axis. The position set-points and the measured positions will be taken to be "modulo 360°". (The modulo corresponds to the difference *upper limit - lower limit*.) "Apply the specified modulo" means the user does not need to control the equivalence relation between the absolute positions -180° and +180°. Applying a modulo with an upper limit of +180° and a lower limit of -180° to the value of 470° returns 110° (470° - n times the modulo, where n = 1); applying it to a value of -200° returns +160° (-200° + n times the modulo, where n = 1). When a movement is requested, motion is not controlled with the notion of the "shortest path". A request for movement to the absolute position 900° will make the plate turn through 2 1/2 revolutions. When motion is completed, the position counter will show +180° (900° - n times the modulo, where n = 2).

The modulo function also makes it possible to avoid reaching the maximum counting capacity of the system. Unless otherwise specified by the user, the system will apply of its own accord and as a safety measure a modulo with an upper limit of 100000000 unit1 (or 100000000 encoder transitions) and for the lower limit a lower limit value of -100000000 unit1 (or -1000000000 encoder transitions).

Tip: the modulo upper limit and modulo lower limit values must correspond to a complete number of encoder increments or encoder emulation increments so as to avoid losing remainders from division operations.

Apply specified modulo	Check ☒ this box to validate the modulo specified by the upper limit and lower limit fields below. [corresponding parameter: <i>modul1_en</i>] If this box is not checked, the system modulo will be applied.
Modulo upper limit	Enter the value of the upper threshold of the modulo in this field. [corresponding parameter: <i>modul1_up</i>]
Modulo lower limit	Enter the value of the lower threshold of the modulo in this field. [corresponding parameter: <i>modul1_low</i>]

5.2.1.5 Movement

<i>Acceleration / Deceleration</i>	In this field, enter the selected acceleration / deceleration level, expressed in <i>unit1/s²</i> . See the <i>Setting Calculation</i> tab in the <i>Servocontrol Settings</i> window for information on programming values. [Corresponding Parameter: <i>accel_max</i>]
<i>Stop Window</i>	In this field, enter the stop window value desired in <i>unit1</i> . This value is used to declare the end of a movement (axis stationary). [Corresponding Parameter: <i>target</i>]
<i>Max. Speed for Application</i>	In this field, enter the maximum speed of the application expressed in <i>unit1/s</i> . See the <i>Setting Calculation</i> tab in the <i>Servocontrol Settings</i> window for information on programming values. [Corresponding Parameter: <i>speed_max</i>]
<i>Maximum Tracking Error</i>	In this field, enter the maximum tracking error authorized, expressed in <i>unit1</i> . [Corresponding Parameter: <i>trackerror_max</i>]

5.2.1.6 Actions of OK and Cancel buttons depending on OFF LINE or ON LINE status

OFF LINE Status

- When a work session is opened (*Open* command), the contents of a parameter file, stored in bulk memory (diskettes or hard drive), are recopied into the RAM_PC.
The data entry window displayed on the screen is a work memory.
When a user customizes his application, this work memory is modified.

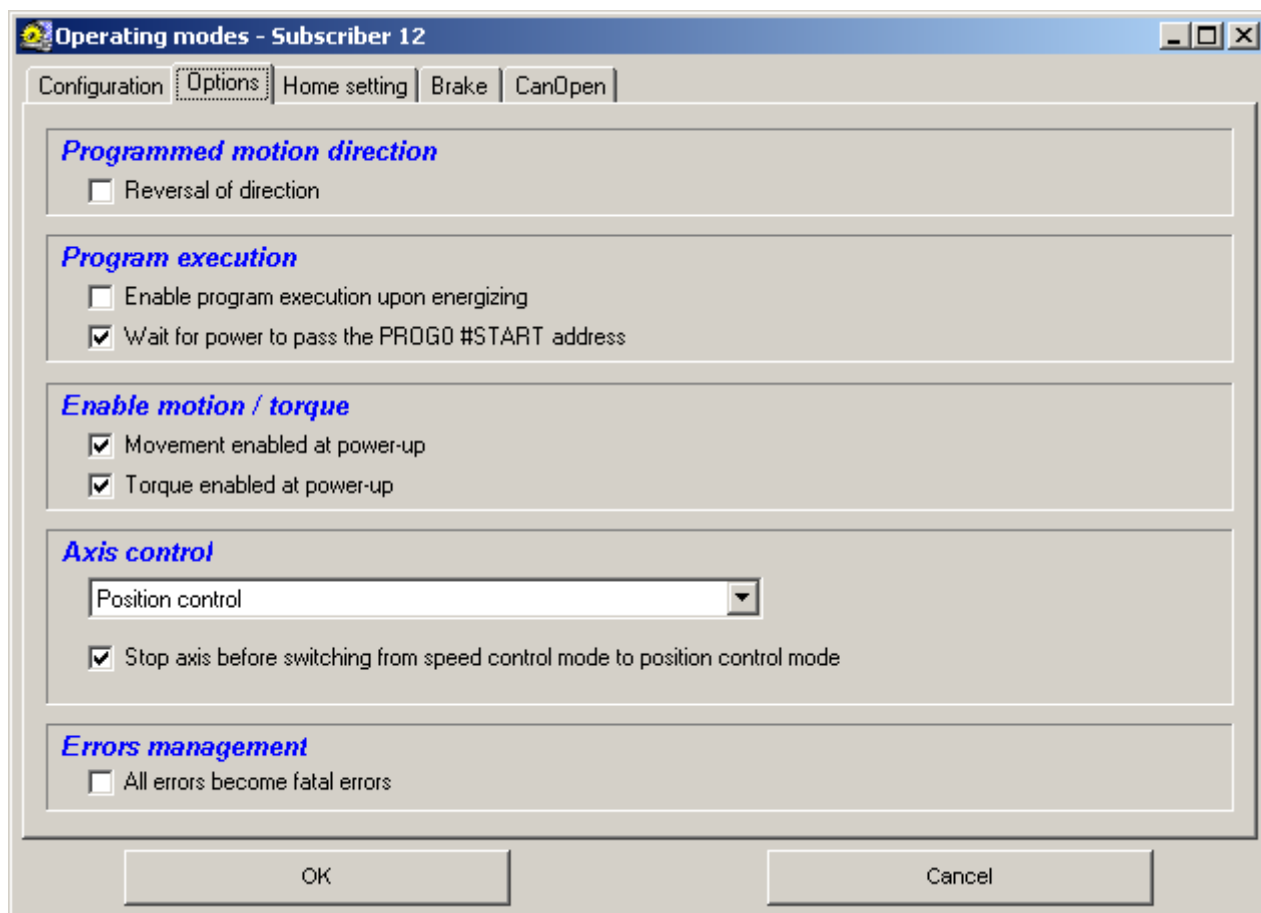
OFF LINE Status	
OK	Saves the contents of the work memory in the RAM_PC, and then closes the current data entry window.
Cancel (or  button)	Closes the current data entry window without modifying the RAM_PC.

ON LINE Status

- At power-up, the drive RAM (RAM_DM) is automatically loaded with the contents of its back-up memory (EEPROM_DM).
- The *Connection* command recopies the entire drive RAM (RAM_DM) into the RAM_PC.
- The *Global Transfer* recopies the entire RAM_PC:
 - into the drive RAM (RAM_DM) **and**
 - into its back-up memory (EEPROM_DM), on request only.
- When a configuration window is opened, the information concerning this window are copied from the RAM_DM into the RAM_PC.
The data entry window displayed on the screen is a work memory.
When the operator changes the parameter settings for the window, the modifications affecting the work memory are immediately recopied into RAM_DM. These are the only uses of the *ON LINE* function.

ON LINE Status	
OK	Saves the contents of the work memory in the RAM_PC, and then closes the current data entry window.
Cancel (or  button)	1] Closes the current data entry window. 2] Transfers the original parameters of the window contained in the RAM_PC into the RAM_DM, if the work memory was modified (and therefore cancels the modifications).

5.2.2 Options



This environment defines operating options that will be applied to the axis.

5.2.2.1 Programmed motion direction

<i>Reversal of programmed movements</i>	Check ✓ this cell to reverse the direction of programmed movements. This function is very useful in the debugging phase because it does not require the "physical" reversal of position, speed and displacement setpoint returns in order to obtain the desired direction of displacement. [Corresponding Parameter: <i>dir_inv</i>]
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5.2.2.2 Program execution

Please refer to the DIGIVEX Motion "PVD 3517 - Programming Manual" for further details.

<i>Authorizes program execution at power-up</i>	Check ✓ this cell to authorize program execution when auxiliary power is present. In this event, when auxiliary power is present, the execution of the PROG0 program will start at the #INIT address and will be carried out in sequence. [corresponding parameter: <i>exec_en</i> = 1] The passing through of the #START address will depend on the setting contained in the data field: <i>"Wait for power to be present to pass through the PROG0 #START address "</i>.
<i>Wait for power to be present to pass through the PROG0 #START address</i>	⇒ Check ✓ this cell to validate this choice. The following actions depend on the detection of the "power": - the passing through of the #START address by the operational pointer of the main PROG0 program; and, - the subsequent execution of user programs. This option is useful because it can start up automatic control system programs (or certain user programs) without "power". This is because only the declarative zone of the program is explored by the operational pointer. ⇒ When this cell is not checked, there is no stop point at the #START address; user programs are executed by PROG0 all at the same time (i.e. with or without power). [Corresponding Parameter: <i>userprog_option</i>]

5.2.2.3 Movement / torque authorization

<i>Movement authorized at Power-up</i>	Check ✓ this cell to authorize movement at power-up (obviously, power must be present in order for this option to be effective). This cell is checked by default. [corresponding parameter: <i>move_en</i> = 1]
<i>Torque authorized at Power-up</i>	Check ✓ this cell to authorize torque at power-up (obviously, power must be present in order for this option to be effective). This cell is checked by default. [corresponding parameter: <i>torque_cmd</i> = 1]

5.2.2.4 Axis drive

<i>Position drive</i>	Select this assignment from the drop-down menu to drive the position of the drive (option selected by default). [corresponding parameter: <i>drive_mode</i> = 0] Where zero torque setting (<i>torque_cmd</i> = 0) or power absent (<i>drive_ok</i> = 0) are concerned, the validated torque information is set to 0 (<i>torque_on</i> = 0). The absolute position instruction (<i>posa</i>) is then forced to the actual position value of the controlled axis (<i>pos1</i>) in order to prevent any inopportune surges when power comes back on and when torque is validated (surges that might occur if the axis position has been changed in between times). Counting of the actual axis position stays validated as long as the auxiliary power supply stays on.
<i>Speed drive</i>	Select this assignment from the drop-down to drive the speed of the drive (speed instruction given by the <i>speed_value</i> variable) The position remains measured and the tracking error is set at 0. The acceleration/deceleration parameters remain acknowledged. The trajectory generator remains active. [corresponding parameter: <i>drive_mode</i> = 1]
<i>Torque drive</i>	Select this assignment from the drop-down menu to drive the torque of the drive (torque instruction given by the <i>torque_value</i> variable) The position remains measured and the tracking error is set at 0 (position instruction = measured position → tracking error = 0). The position and speed loops are no longer active. [corresponding parameter: <i>drive_mode</i> = 2]
<i>CANopen Position drive with interpolation</i>	Select this assignment from the drop-down menu to drive the position of the drive using interpolation and synchronization messages. A supervisor card must be used for this operating mode. The card sends cyclic, synchronized position instructions to one or more axes via PDO CANopen messages (see PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual). This operating mode would be used when a precise, synchronized movement must be carried out on more than one axis at a time. Use PDO Rx = 3 (Control Word + Target Position) or PDO Rx = 21 (Control Word + Torque Max + Target Position). [corresponding parameter: <i>drive_mode</i> = 3]
<i>CANopen Profile Position Mode</i>	Select this assignment from the drop-down menu to drive the drive by remote control in position drive mode. A supervisor card must be used for this operating mode. The card sends position instructions using PDO CANopen messages (see PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual). The position instructions, which do not have to be cyclic, are acknowledged by the trajectory generator (<i>posa</i> or <i>posr</i> system variables). Use PDO Rx = 3 (Control Word + Target Position) or PDO Rx = 21 (Control Word + Torque Max + Target Position). [corresponding parameter: <i>drive_mode</i> = 4]

Remark: The *drive_mode* and *speed_option* parameters are not managed by PME software and 1st generation positioner drives.

<i>CANopen Profile Velocity Mode</i>	Select this assignment from the drop-down menu to drive the drive by remote control in speed drive mode (speed expressed in unit1/s). A supervisor card must be used for this operating mode. The card sends speed instructions using PDO CANopen messages (see PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual). The speed instructions, which do not have to be cyclic, are acknowledged by the <i>speed_value</i> system variable. Use PDO Rx = 4 (Control Word + Target Velocity). [corresponding parameter: <i>drive_mode</i> = 5]
<i>CANopen Profile Torque Mode</i>	Select this assignment from the drop-down menu to drive the drive by remote control in torque drive mode. A supervisor card must be used for this operating mode. The card sends torque instructions using PDO CANopen messages (see PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual). The torque instructions, which do not have to be cyclic, are acknowledged by the <i>torque_value</i> system variable. Use PDO Rx = 5 (Control Word + Target Torque). [corresponding parameter: <i>drive_mode</i> = 6]
<i>CANopen Velocity Mode</i>	Select this assignment from the drop-down menu to drive the drive by remote control in speed drive mode (speed expressed in rpm). A supervisor card must be used for this operating mode. The card sends speed instructions using PDO CANopen messages (see PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual). The speed instructions, which do not have to be cyclic, are acknowledged by the <i>speed_value</i> system variable having been converted to unit1/s. Use PDO Rx = 6 (Control Word + VL Target Velocity). [corresponding parameter: <i>drive_mode</i> = 7]
<i>Axis stoppage before changing from speed drive mode to position drive mode</i>	Check ☒ this cell to cause the axis to stop automatically (zero speed instruction) before effectively changing from speed drive mode to position drive mode. This cell is checked by default. [corresponding parameter: <i>speed_option</i> = 0] Remark: If this cell is not checked, the axis will go on to infinity without changing its speed.

Remark: The *drive_mode* parameter is not managed by PME software and first-generation positioner drives.

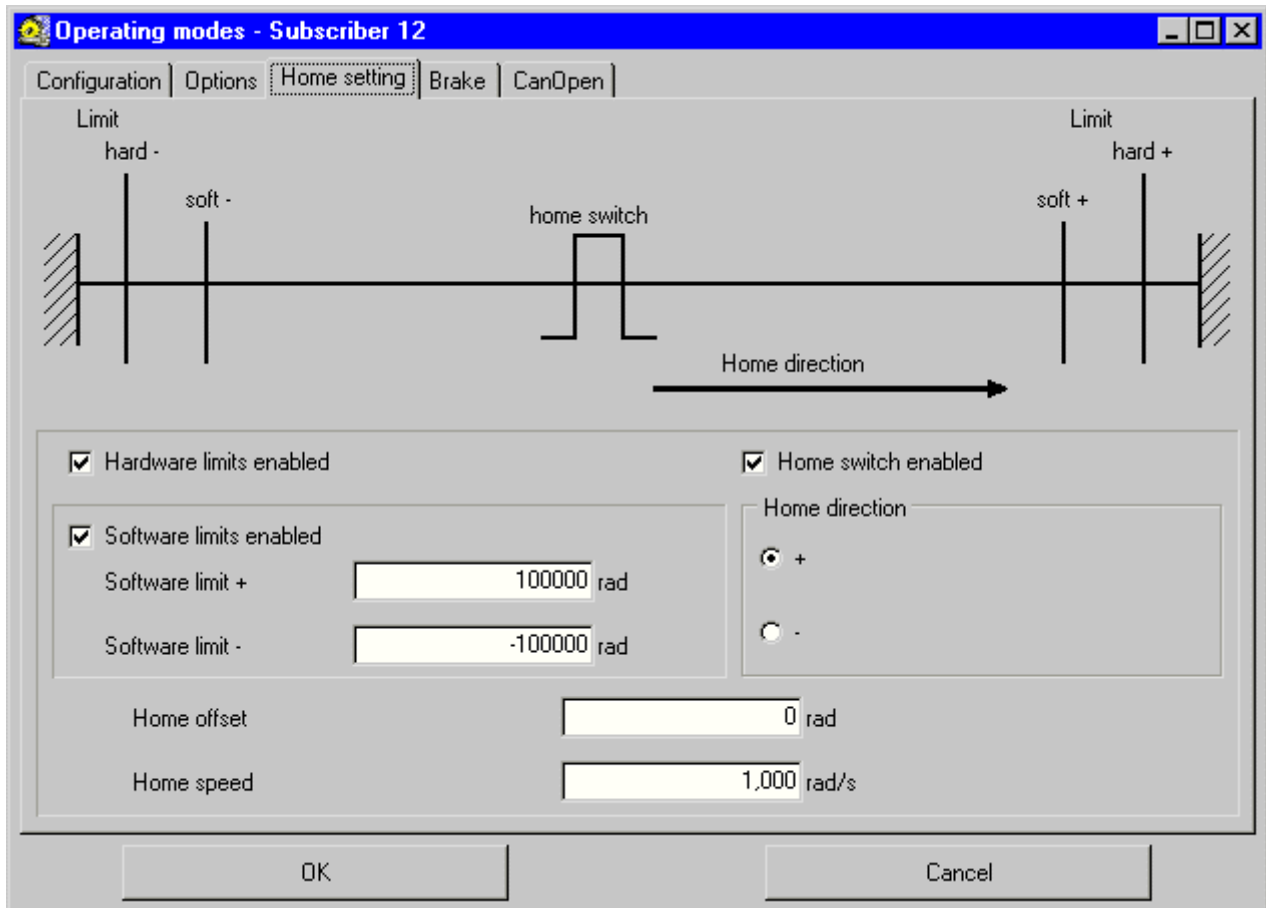
5.2.2.5 Fault managements

<i>All faults become major faults</i>	Check ☒ this cell so that all signalled faults (minor or major) are managed as major faults (side-effect of the positioner drive OK relay). This cell is not checked by default ⇔ [corresponding parameter: <i>fault_option</i> = 0]
---------------------------------------	---

Remark: The *fault_option* parameter is managed by PME software and positioner drives above 5th generation.

5.2.3 Home Setting

When the Operating Modes menu is opened and the tab called Home Setting is selected, the following window is displayed:



The home setting corresponds to the search for the cam (switch0_input 24V logic input) and encoder 0 timing signal (or resolver 0 timing signal) coincidence

This environment is used to characterize the displacement procedure called for when referencing measurements.

<i>Hardware Limits Active</i>	Check ✓ this cell to effectively acknowledge the Hardware limits during axis displacement. [Corresponding Parameter: <i>hardlimit_en</i>]
-------------------------------	---

<i>Software Limits Active</i>	Check ✓ this cell to effectively acknowledge the software limits during axis displacement. [Corresponding Parameter: <i>softlimit_en</i>]
-------------------------------	---

If the "*Software Limits Active*" cell is checked, enter the following information:

<i>Limit +</i>	expressed in <i>unit1</i> [Corresponding Parameter: <i>softlimit_p</i>]
<i>Limit -</i>	expressed in <i>unit1</i> [Corresponding Parameter: <i>softlimit_m</i>]

The software limits are generated by the system. They are used to stop movement before the Hardware limits and the extremity limits are reached. They are only active when a home setting has been configured.

The + *Limit* and – *Limit* values are acknowledged as soon as the home setting is configured (and on condition that the "*Software Limits Active*" cell is checked).

N.B. The extremity limits are represented by dotted-line zones. (See data entry window.) They cut the power of the drive via an appropriate remote control device. For the unit to be disengaged before an *Hardware limit* is attained, a sufficiently long deceleration distance must be taken into account so that the extremity limit is not reached.

<i>Home Cam Acknowledgement</i>	This cell is checked ✓ by default. [Corresponding Parameter: <i>switch0_en</i>] If the home cam is not acknowledged, only the encoder 0 timing signal (or resolver 0 timing signal), will be used to reference the measurement start point. (The logical <i>switch0_input</i> input is then considered as being permanently equal to 1).
<i>Direction of Home Setting</i>	Set button ⊙ to + or – according to the desired direction of displacement. [Corresponding Parameters: <i>home_dir</i> = 0 for + direction <i>home_dir</i> = 1 for – direction]
<i>Home Offset</i>	Enter the desired home offset, expressed in <i>unit1</i> . [Corresponding Parameter: <i>home_offset</i>]
<i>Home Speed</i>	Enter the desired speed, expressed in <i>unit1/s</i> . [Corresponding Parameter: <i>home_speed</i>]

5.2.3.1 Axis displacements during the home setting

Depending on the initial position of the axis, one of the following cases applies:

- The axis is not initially found on the home cam:
 - 1st Case: The axis moves in the specified direction [see *Direction of Home Setting*]; it meets the rising edge of the cam, then the encoder 0 timing signal (or the resolver 0 timing signal); at the cam and 0 timing signal coincidence, it decelerates and then stops.
 - 2nd Case: The axis moves in the specified direction, but meets an electrical limit. The displacement direction is automatically reversed until it meets the cam and then is disengaged. The displacement direction is then re-established (it corresponds to the *Direction of Home Setting*) and the axis continues moving as in the 1st case.
- The axis is found on the cam in its home position **and** the *Home Cam Acknowledgement* option is validated:
 - 3rd Case: The axis is disengaged from the cam in the opposite direction of the *Direction of Home Setting*. When the cam is disengaged, the displacement direction is then reversed (it corresponds to the *Direction of Home Setting*) and the axis continues moving as in the 1st case.
- The *Home Cam Acknowledgement* option is not validated:

The 1st case applies: The axis moves in the specified direction [see *Direction of Home Setting*]; when it meets the encoder 0 timing signal (or the resolver 0 timing signal), it decelerates and then stops.

5.2.3.2 Important Comments

- It is the first encoder 0 timing signal (or resolver 0 timing signal) met on the cam (when it has been acknowledged), in the *Direction of Home Setting*, which defines the *Home* position. Afterwards, this position will be considered as the reference in the absolute mark. It is a 0 reference if the *Home Offset* equals 0 [Corresponding Parameter: *home_offset* = 0]. The *Home* position is repetitive.
- The stop position is linked to the deceleration of the axis and resisting forces. The stop position is not repetitive.
- The *Home Offset* or axis displacements to a pre-determined position must be programmed using a set of instructions that has been made available. (See Programming Manual.)

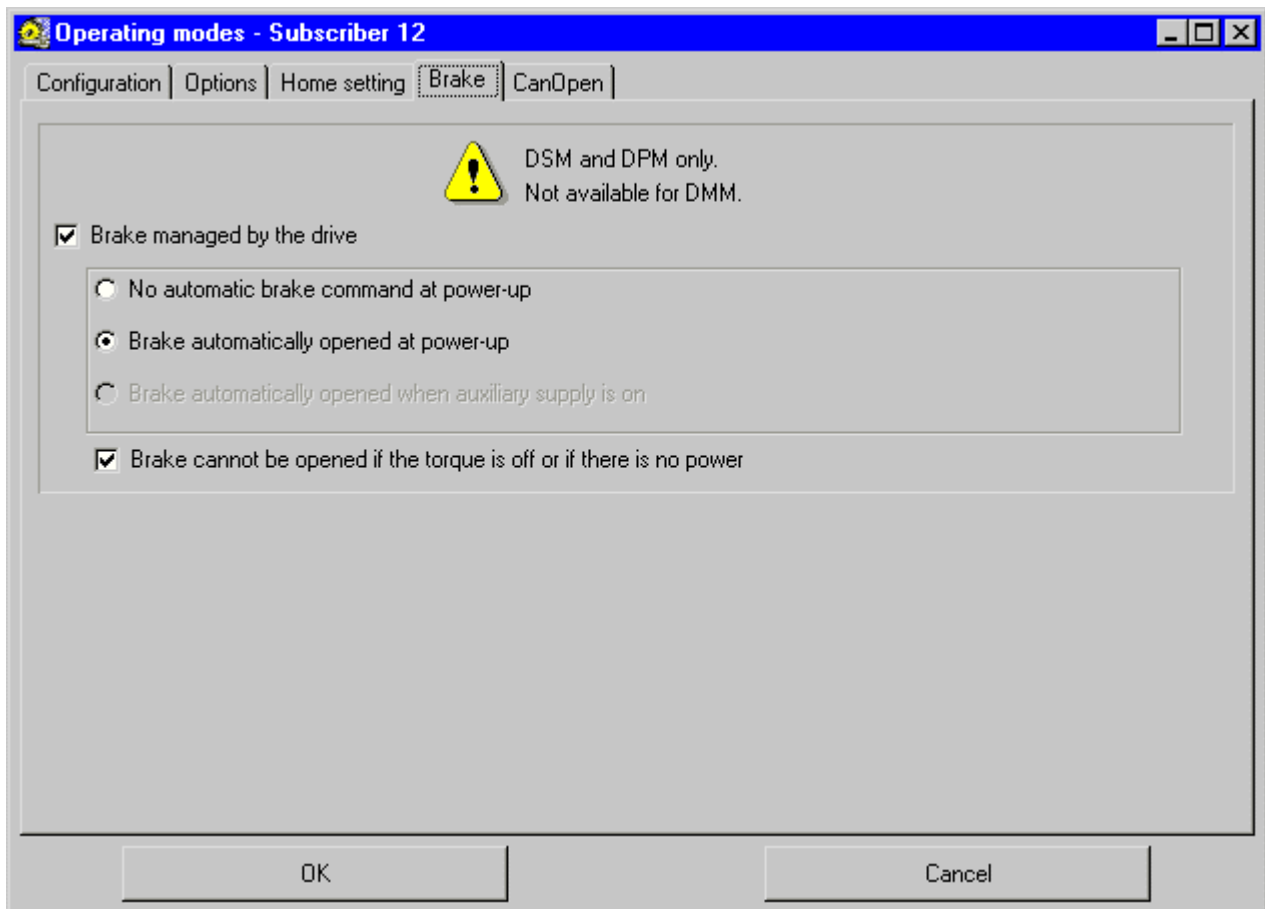
Recommended Procedure:

- 1] Set the parameters of a home setting with the *Home Offset* equal to 0 (default value).
- 2] When this home setting is configured, manually, or by programming, move the axis to the desired *Home* position. Read the real position of the axis indicated by the *pos1* variable; do this using the *Variable Watcher*. Enter the position read in *pos1* into the *Home Offset field* (IMPORTANT, do not inverse the sign!).
- 3] Reset the home setting parameters.
- 4] For verification purposes, demand that the axis be displaced to the *Home* position (*pos1* = 0). The physical position of the axis when stopped must coincide with the desired *Home* position.

When all entries are correctly filled in, click on the button.

5.2.4 Brake

Click on Operating Modes and select the Brake tab to open the following window:



This environment is used to manage the brake, if a brake was previously declared in *Set Drive Parameters*, select *Motor / Resolver*, tab *Motor*.

Comments:

- DSM and DPM –type drives:

A relay used to manage the brake is integrated into each one of these drives.

- "brake relay" open $\Leftrightarrow$ brake closed (positive safety) $\Leftrightarrow$ motor axis blocked,
- "brake relay" closed $\Leftrightarrow$ brake open $\Leftrightarrow$ motor axis free.

- DMM –type drives:

These speed drives do not include a brake relay. Therefore, the brake must be managed externally. Do not check the cell: ☐ *Brake managed by drive*.

Implementation:

The description below corresponds to a set-up using *DSM* or *DPM* –type drives.

In addition to the parameter option, the user is able to use the following instructions for operating the brake:

<i>brake_emergency</i> = 1	Emergency open command for the brake relay. This causes: - a speed demand of zero, - the immediate opening of the brake relay, - a delayed torque disengagement (100 ms delay for dynamically braking the axis).
<i>brake_cmd</i> = 1	Brake close command (therefore, the brake relay is opened).
<i>brake_cmd</i> = 0	Brake open command (therefore, the brake relay is closed).

5.2.4.1 Case No.1: No Brake

This declaration is a part of the following environment: *Motor / Resolver*, tab *Motor*, entry *Motor with brake*, cell not checked [Corresponding Parameter: *brake_en* = 0].

In this context:

- the brake relay is permanently open (no brake management),
- the emergency open command for the brake relay is not managed,
- the brake open/closed command instructions are not managed,
- a serious fault causes the immediate de-validation of the torque.

5.2.4.2 Case No.2: Brake present, but not managed by the drive

[Corresponding Parameter: *brake_management* = 0]

In this context:

- the brake relay is permanently closed (no brake management),
- the emergency open command for the brake relay is not managed,
- the brake open/closed command instructions are not managed,
- a serious fault causes the immediate de-validation of the torque.

5.2.4.3 Case No.3: Brake present, and managed by the drive (usual case)

This selection is suggested by default. It is impossible to open the brake when the torque is disengaged.

- The brake is managed by the drive:
[Corresponding Parameter: *brake_management* = 1]
- The brake is automatically opened when power is detected:
[Corresponding Parameter: *brake_init* = 1]
or not at all: (there is not an automatic brake command at power-up),
[Corresponding Parameter: *brake_init* = 0]
- The brake cannot be opened if the torque is disengaged or if there is no power:
[Corresponding Parameter: *brake_option* = 1].

In this context, the brake management mode is as follows:

- The brake relay is opened at initialization ("brake relay" open = brake closed in positive safety).
- A system protective device is implemented to prevent the brake from opening when the torque is disengaged or when there is no power.
- If a torque disengagement demand is requested by a user command, the brake relay is opened prior to the torque disengagement.
- The management of the emergency open command for the brake relay causes the following:
 - a speed demand of zero,
 - the immediate opening of the brake relay,
 - a delayed torque disengagement (100 ms delay for dynamically braking the axis).
- The management of the brake close command statement (by user command) causes the following:
 - a speed demand of zero,
 - waits for the speed to fall below 60 rpm before sending the open command to the brake relay,
 - a delayed torque disengagement (delay depending on the time for the effective closing of the brake: *brake_ton*).
- The management of the brake open command statement (by user command) causes the following:
 - brake relay closed only if there is power and the torque is validated.
- When the brake supply is removed, the following occurs:
 - a speed demand of zero,
 - a delayed torque disengagement (delay depending on the time for the effective closing of the brake: *brake_ton*).
- When a serious fault is detected, the following occurs:
 - the torque is immediately invalidated,
 - the brake relay is immediately opened.

5.2.4.4 Case No.4: Brake present and managed by the drive (specific case)

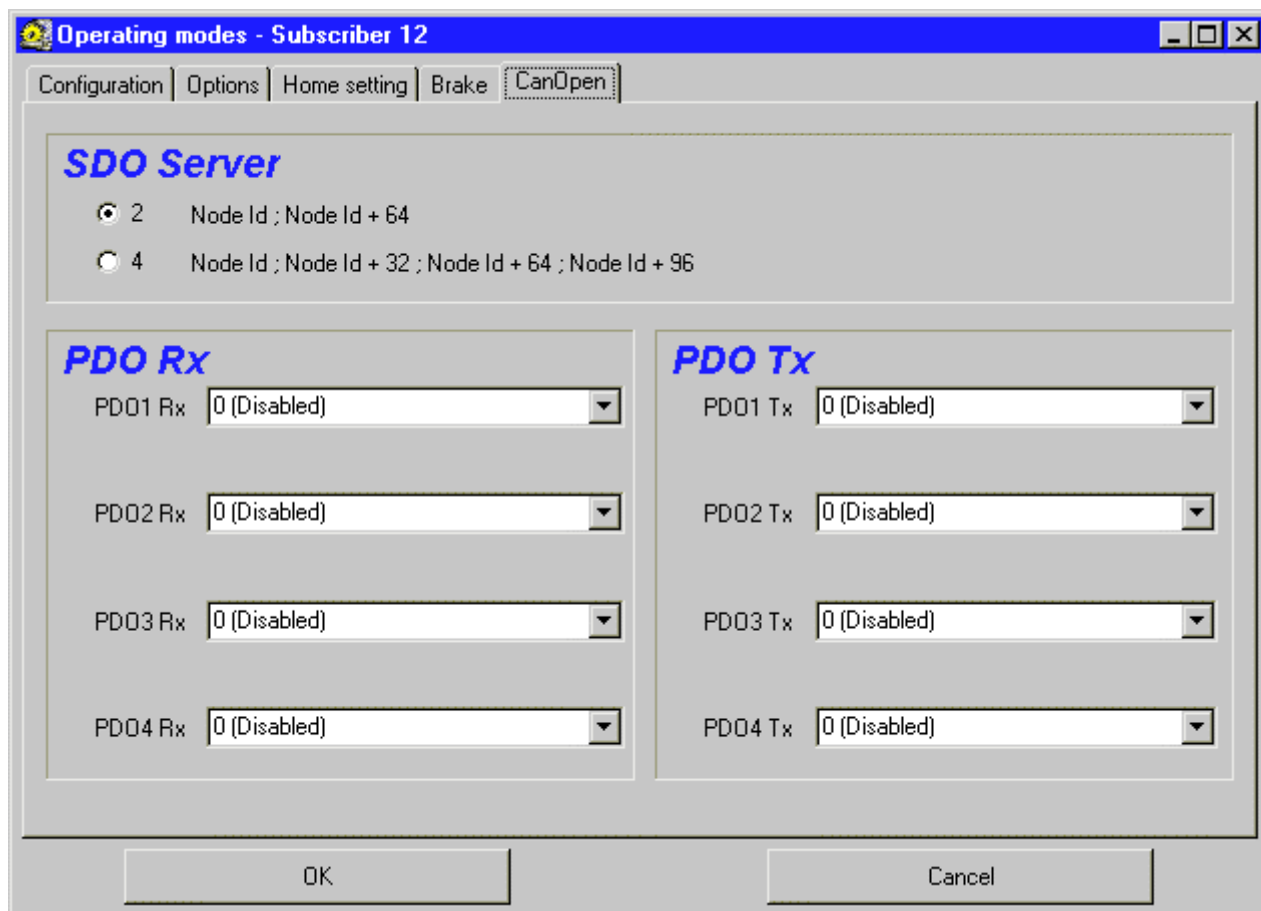
The brake management mode is the same as in case no.3 except for one thing: there is no system protective device to prevent the brake from opening when the torque is disengaged or when there is no power.

- The brake is managed by the drive: *[brake_management = 1]*
- The brake is automatically opened when power is detected: *[brake_init = 1]*,
or when the auxiliary power is detected: *[brake_init = 2]*,
or not at all: *[brake_init = 0]*.
- The brake can be opened when the torque is not applied or when there is no power: *[brake_option = 0]*

When all entries are correctly filled in, click on the OK button.

5.2.5 CanOpen

This tab only appears for a CANopen structure. The following window is opened by clicking on Operating Modes and selecting the CanOpen tab:



5.2.5.1 SDO Server

SDO Server	Position ☒ on 2 to have 2 SDO communication channels available [corresponding parameter: SDO_server = 0, default value]. The CANopen network is then limited to 63 subscribers. Position ☐ on 4 to have 4 SDO communication channels available [corresponding parameter: SDO_server = 1]. The CANopen network is then limited to 31 subscribers. The 4 channel mode would be selected should more than 2 customers contact the same server at the same time (see additional information).
------------	---

Remark: The SDO_server parameter is not managed by PME software and the 1st, 2nd and 3rd positioners generation which only accept one SDO channel.

Additional information:

The Customer/Server operating mode allows SDO messages to be exchanged on a CANopen network. Hence, requests coming from various customers can be answered by a positioner drive (server) using the PC (via a CRS232 or CIM03 interface unit), of an appliance fitted with CANopen interface or other positioner drives.

We recommend that each "Customer/Server Couple" has their own communication channel in order to avoid communication problems between the server and the various customers. For this to be achieved, the server's appliance must have the ability to use several communication channels.

An appliance (subscriber) connected to the CANopen bus has a basic address that we call Node Id. This address, in the case of a positioner drive, corresponds to the subscriber's number defined by the physical position of the rotary mini-switch available on the front panel.

The appliance connected to the CANopen bus has additional available addresses when several communication channels have been declared, thus allowing it to establish various data flux. If 2 channels are available, the appliance has 2 addresses: a physical, Node Id, address and a virtual, Node Id + 64, address. If 4 channels are available, the appliance has 4 addresses: a physical, Node Id, address and 3 virtual, Node Id + 32, Node Id + 64 et Node Id + 96, addresses.

Channel 0 (Node Id addresses) should be used for communications passing via the CRS232 or CIM03 interface module (PME software, remote control via a RS232 link, etc.). Other channels (Node Id + 32, Node Id + 64 and Node Id + 96 addresses) would be used for direct interaction between the bus's various appliances.

Example: Either a 2 SDO channel operating mode and two DSM positioner drives with 5 and 6 physical addresses interacting between them. The PME software addresses the positioners with 5 and 6 addresses. The two positioner drives would exchange data using the 69 (5+64) and 70 (6+64) addresses.

5.2.5.2 PDO Rx

In read mode, DIGIVEX Motion positioners are capable of managing up to 4 different PDO messages (the receiving of instructions from a supervisor).

PDO Rx 1	This field defines the PDO Rx 1 message content [corresponding parameter: PDO1_rx_cfg]. The selection is carried out using a drop-down list ▼ 0 : inactive (default value) 1 : Control Word 2 : Control Word + Mode Of Operation 3 : Control Word + Target Position 4 : Control Word + Target Velocity 5 : Control Word + Target Torque 6 : Control Word + VL Target Velocity 21 : Control Word + Torque Max (0.01 Nm) + Target Position 22 : Control Word + Torque Max (Nm) + Target Position 23 : Control Word + Current reduction (0,01A) + Target Position Remarks: The PDO message content is defined in accordance with the DS402 CANopen standard. For further information concerning the use of PDO messages, please refer to the PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual.
PDO Rx 2	This field defines the PDO Rx 2 message content [corresponding parameter: PDO2_rx_cfg]. The selection is carried out using a drop-down list ▼
PDO Rx 3	This field defines the PDO Rx 3 message content [corresponding parameter: PDO3_rx_cfg]. The selection is carried out using a drop-down list ▼
PDO Rx 4	This field defines the PDO Rx 4 message content [corresponding parameter: PDO4_rx_cfg]. The selection is carried out using a drop-down list ▼

Remark: The PDO_n_rx_cfg parameters are not managed by PME software and the 1st, 2nd and 3rd positioners generation.

5.2.5.3 PDO Tx

In transmission, DIGIVEX Motion Drive positioners are capable of managing up to 4 different PDO messages (the sending of condition returns to a supervisor).

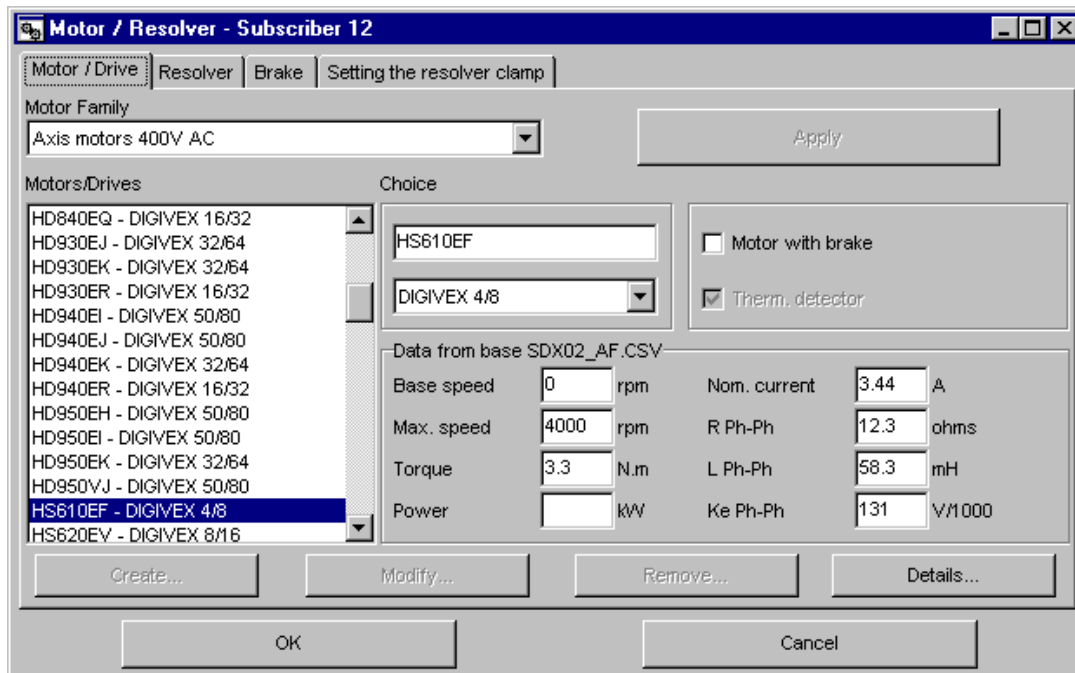
PDO Tx 1	This field defines the PDO Tx 1 message content [corresponding parameter: PDO1_tx_cfg]. The selection is carried out using a drop-down list ▼ 0 : inactive (default value) 1 : Status Word 2 : Status Word + Mode Of Operation Display 3 : Status Word + Position Actual Value 4 : Status Word + Velocity Actual Value 6 : Status Word + VL Control Effort 21 : Status Word + Torque Actual Value (0,01 Nm) + Position Actual Value 22 : Status Word + in_port + pos_memo (PDO message transmitted after an event: following a change in status of any one of the <i>in0</i> to <i>in15</i> on/off control inputs. Reception of a SYNC message does not result in transmission of a PDO message). 23 : Master Actual Value (pos2) 24 : PxStatus Word + Torque Actual Value (0.01 Nm) + Position Actual Value 25 : PxStatus Word + Torque Actual Value (Nm) + Position Actual Value 26 : PxStatus Word + id_measure (0,01A) + Position Actual Value Remarks: The PDO message content is defined in accordance with the DS402 CANopen standard. For further information concerning the use of PDO messages, please refer to the PVD3543 "DIGIVEX Motion - Remote control using PDO messages" Software Application Manual.
PDO Tx 2	This field defines the PDO Tx 2 message content [corresponding parameter: PDO2_tx_cfg]. The selection is carried out using a drop-down list ▼
PDO Tx 3	This field defines the PDO Tx 3 message content [corresponding parameter: PDO3_tx_cfg]. The selection is carried out using a drop-down list ▼
PDO Tx 4	This field defines the PDO Tx 4 message content [corresponding parameter: PDO4_tx_cfg]. The selection is carried out using a drop-down list ▼

Remark: The PDO_n_tx_cfg parameters are not managed by PME software and the 1st, 2nd and 3rd positioners generation.

5.3 Motor / Resolver

Click on the *Motor / Resolver* button to open the following window:

5.3.1 Motor



This environment is used to select the Motor / Drive association for the application.

<i>Motor Family</i>	Use the ▼ key to access the drop-down list. Select the family of the motor being used. Example of Motor families: Axis Motors 230 V AC Axis Motors 400 V AC ... Spindle Motors 230 V AC Spindle Motors 400 V AC ... Axis Motors AXL 230 V AC Axis Motors AXL 400 V AC ... Explosion-proof Axis Motors 230 V Explosion-proof Axis Motors 400 V ... Specific Motors
---------------------	--

When "Specific Motors" is selected in the *Motor Family* data entry field, the *Create*, *Modify*, and *Remove* function keys are made available.

<i>Create</i>	This key is used to create a set of parameters that characterize the specific motor.
<i>Modify</i>	This key is used to modify the set of parameters of an existing specific motor.
<i>Remove</i>	This key deletes the definition of the selected specific motor from the list of existing specific motors.

<i>Motors / Drives</i>	Select the association for the motor with the current range for the drive from the list. The reference for the selected motor as well as the current range for the associated drive appear separately in a display window. Example: HS610EF DIGIVEX 4/8
------------------------	--

The current range for the motor can be modified by clicking on ▼ facing the display window. However, this capability is controlled by the software program in order to eliminate incompatible current ranges for the motor being used.

For information:

- For a spindle motor, only an increase in the current range in relation to the initial association is authorized; this is justified by the fact that the drive must be able to permanently deliver the short-circuit current for the spindle motor, in "defluxed" mode.
- For an explosion-proof motor, the current range cannot be modified. This is because it is the association of the motor with its drive that meets the standards.

<i>Data from base</i>	Data relating to the motor database is displayed in the lower, right-hand corner of the window. This data cannot be modified by the user.
<i>Motor with Brake</i>	Check ✓ this cell when the motor is equipped with a brake. [Corresponding Parameter: <i>brake_en</i> = 1]
<i>Therm. Detector</i>	This option is validated by default for standard motors. Comment: The motor database displays whether or not the motor is equipped with a heat detection probe.
<i>Apply</i>	This key is only available during <i>ON LINE</i> status. It is used to transfer data relating to the new choice of motor to the RAM_DM when all data entry fields have been filled in. It has the same function as the OK button, except that it does not close the Motor/Resolver window.

When all the data for *Motor*, *Resolver*, *Brake*, *Set Resolver Calibration* tabs have been correctly entered, exit the *Motor / Resolver* environment by clicking on the button.

Click on the *Details* button to display the two definition pages of motor parameters. They are displayed by clicking on tabs *Page 1* and *Page 2*.

Motor Definition window, *Page 1* tab:

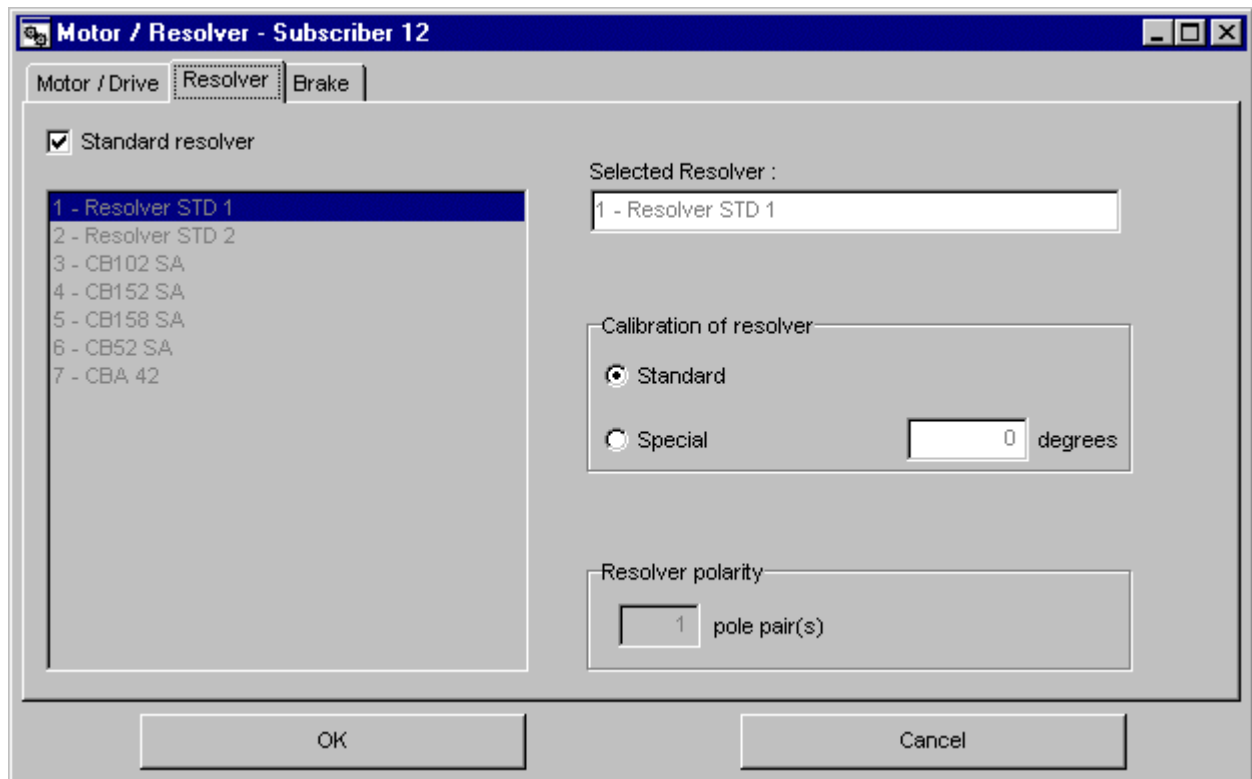
Parameter	Value	Unit
Motor name	Nmot	HS610EF
Drive name	Nvar	DIGIVEX 4/8
Resolver type	TypC	1 - Resolver STD 1
Brake type	TypF	3 - Frein 9 N.m
Continuous supply voltage in load	U	540 V
Pulsed current at peak value	$\hat{I}_{imp}$	7,6 A
Peak permanent current in slow rotation	$\hat{I}_o$	3,44 A
Torque in slow rotation	M _o	3,3 N.m
Peak K _e between phases	K _e	131 V
Resistance between phases at 25 °C	R	12,3 ohms
Inductor between phases (I _d axes, I _q spindles)	L	58,3 mH
Phase advancement in electrical degrees at $\hat{I}_o$	Av _{rl}	15 °Electr.
Maximum phase advancement in electrical degrees	Av _{sat}	30 °Electr.
Number of motor pole pairs	P _p	5
Maximum speed	N _{max}	4000 rpm
Maximum torque	C _{max}	6,59 N.m
Maximum speed at C _{max}	N _x C _x	2710 rpm

Motor Definition window, *Page 2* tab:

Parameter	Value	Unit
Maximum torque at N _{max}	C _x N _x	4 N.m
Thermal time constant of copper	C _{thc}	189 s
Type of drive (1=axis, 2=spindle)	P _{il}	☒ Axis ☐ Spindle
Base speed (spindle)	V _{base}	0 rpm
Inertia of rotor	J	0,0007 kg.m ²
Maximum temperature of coilings	T _{max}	150 °C
Polynome $\hat{I}=f(N)$ coefficient a	N _a	-3,5328E-5 1/(rpm)
Polynome $\hat{I}=f(N)$ coefficient b	N _b	1,7943E-8 1/(rpm) ²
Polynome $\hat{I}=f(C)$ coef a	$\hat{I}fCa$	0,98682 A/N.m
Polynome $\hat{I}=f(C)$ coef b	$\hat{I}fCb$	0,0037067 A/(N.m) ²
Direct inductor between phases for I = 0	L _{do}	58,272804 mH
Direct inductor between phases for I = I _{max}	L _d I _{max}	29,136402 mH
Motor Family	F _{mot}	1
Inductor between phase quadrature	L _q	58,272804 mH
Thermal time constant for iron losses	C _{thf}	810 s
Magnet temperature coefficient	K _T p _{aim}	0,18 %/°C
Temperature probe present	T _{pt}	2

5.3.2 Resolver

Click on *Motor / Resolver* and select to the *Resolver* tab to open the following window :

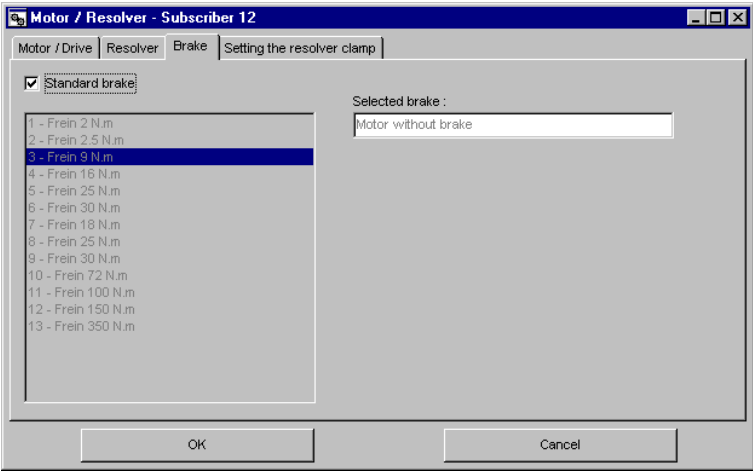


This environment is used to select the type, calibration and polarity of a specific resolver. In most applications, the resolver is standard and the settings listed do not have to be modified.

<i>Standard Resolver</i>	This cell is checked by default. The list indicates which type of resolver is used with the motor.
<i>Selected Resolver</i>	This window displays the selected resolver.
Resolver setting <i>Standard</i> <i>Special</i>	Select ☉ this button if the application is standard. Select ☉ this button to complete the <i>degree</i> zone corresponding to the desired calibration angle. [Important! Do not select this option unless justified.]
<i>Resolver Polarity</i>	This window displays the number of pole pairs of the resolver.

5.3.3 Brake

Click on *Motor / Resolver* and select the *Brake* tab to open the following window:



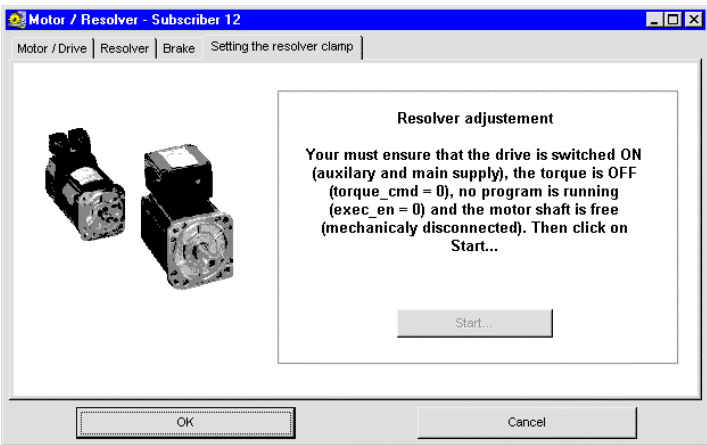
This environment displays the type of brake associated to the motor.

Generally, the settings for this window must not be modified. They only affect motors that are specified having a brake.

Standard Brake	This cell is checked by default. The list displays the type of brake used by the motor.
Selected Brake	This window displays the selected brake. The holding torque supplied by the brake is expressed in Nm.

5.3.4 Setting the Resolver Clamp

Click on *Motor / Resolver* and select the *Set Resolver Clamp* tab to open the following window:



This environment is used to start the procedure for resolver clamping. This procedure must only be carried out by qualified personnel.
 The resolver clamp is used with motors delivered in kits (motor and resolver delivered separately).
 Comment: The resolver clamping is generally done at the factory; exceptionally, the clamping procedure can be carried out in a justified context. The purpose of the clamping is to optimize the phasing of the self-driven, synchronous motor in order to obtain its rated performances. (The max. torque of the motor must be obtained with its max. current in both rotation directions).

Procedure:

Click on "Start".

The ON and OFF buttons are used to switch the current on and off.
 Click on "ON".

The operator turns the resolver stator manually to make the blank zone between the two green bars as small as possible. The position shown is then close to 0 degrees. The resolver stator must, then, be closed and confirmed by "Done", then OK.

5.4 Inputs / Outputs

Click on *Inputs / Outputs* to open the following window:

5.4.1 Logic Inputs

Inputs	Connector	Force	Forcing value	Interrupt edge	Assignment
in0	☐	☐	☐ 0 ☐ 1	☐ + ☐ - 0 ms	
in1	☐	☐	☐ 0 ☐ 1	☐ + ☐ -	
in2	☐	☐	☐ 0 ☐ 1	☐ + ☐ -	
in3	☐	☐	☐ 0 ☐ 1	☐ + ☐ -	
in4	☐	☐	☐ 0 ☐ 1		
in5	☐	☐	☐ 0 ☐ 1		
in6	☐	☐	☐ 0 ☐ 1		
in7	☐	☐	☐ 0 ☐ 1		
in8	☐	☐	☐ 0 ☐ 1		
in9	☐	☐	☐ 0 ☐ 1		
in10	☐	☐	☐ 0 ☐ 1		
in11	☐	☐	☐ 0 ☐ 1		no system assignment
in12	☐	☐	☐ 0 ☐ 1		no system assignment
in13	☐	☐	☐ 0 ☐ 1		no system assignment
in14	☐	☐	☐ 0 ☐ 1		no system assignment
in15	☐	☐	☐ 0 ☐ 1		no system assignment

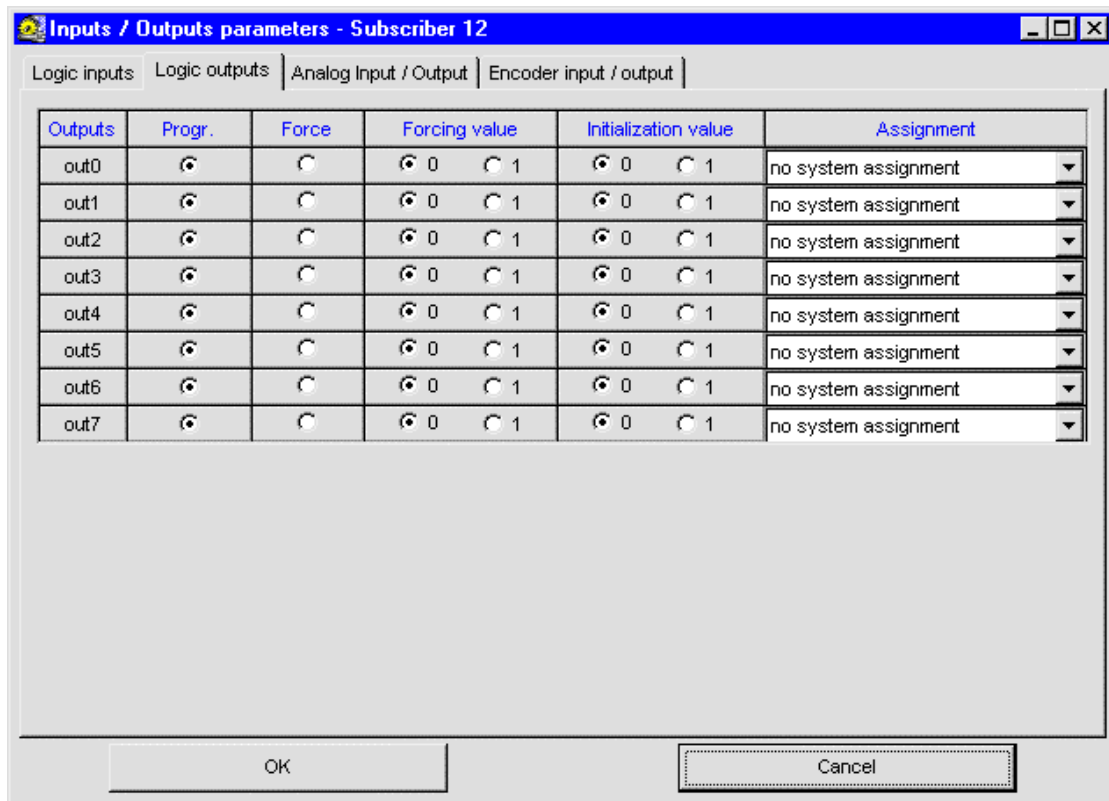
This environment is used to manage logic inputs.
For each logic input, the following data must be entered:

<i>Connector</i>	The physical status (0 or 1) present on the connector is communicated to the logic input. [Corresponding Parameters: <i>m_in0</i> to <i>m_in15</i> = 0]
<i>Force</i>	This selection forces a logic status on the input, independent of the physical status present on the connector. [Corresponding Parameters: <i>m_in0</i> to <i>m_in15</i> = 1]
<i>Forcing Value</i>	The following choices are possible: 0 for a low logic level (<i>false</i> status corresponds to 0 V in input), 1 for a high logic level (<i>true</i> status corresponds to +24 V in input). [Corresponding Parameters: <i>f_in0</i> to <i>f_in15</i>] The forcing value is only acknowledged if the <i>Force</i> option of the corresponding input is validated.
<i>Interrupt Edge</i>	This function is used for inputs <i>in0</i> , <i>in1</i> , <i>in2</i> , and <i>in3</i> when they are associated with a priority sub-program. (See Programming Manual.) The following choices are possible: + for a rising edge (transition from status 0 towards status 1) - for a falling edge (transition from status 1 towards status 0) [Corresponding Parameters: <i>level_in0</i> to <i>level_in3</i> = 0 for a rising ↑ front, = 1 for a falling ↓ front.] For input <i>in0</i> , the interrupt edge cannot be selected: the rising edge is forced. Since this input is used for the exact "dating" of the interrupt event, the response time of the sensor is acknowledged in the <i>__ms</i> data entry field. [Corresponding Parameter: <i>delay_in0</i> , expressed in s]

Assignment	Logic inputs <i>in11</i> to <i>in15</i> can be assigned to system variables. By default, the assignment of these logic inputs is: <i>no system assignment</i>. [Corresponding Parameters: <i>a_in11</i> to <i>a_in15</i>] 0 = not assigned; 1 = assigned to the associated function. The following <i>system variables</i> can be assigned by logic inputs: <table> <tr> <td><i>in11</i> = <i>hardp_input</i></td><td>status of the + hardware limit input,</td></tr> <tr> <td><i>in12</i> = <i>hardm_input</i></td><td>status of the - hardware limit input,</td></tr> <tr> <td><i>in13</i> = <i>switch0_input</i></td><td>status of the home cam input,</td></tr> <tr> <td><i>in14</i> = <i>move_en</i></td><td>feed authorization command,</td></tr> <tr> <td><i>in15</i> = <i>exec_en</i></td><td>execution authorization for programs.</td></tr> </table> The assignments are selected from the drop-down list (▼).	<i>in11</i> = <i>hardp_input</i>	status of the + hardware limit input,	<i>in12</i> = <i>hardm_input</i>	status of the - hardware limit input,	<i>in13</i> = <i>switch0_input</i>	status of the home cam input,	<i>in14</i> = <i>move_en</i>	feed authorization command,	<i>in15</i> = <i>exec_en</i>	execution authorization for programs.
<i>in11</i> = <i>hardp_input</i>	status of the + hardware limit input,										
<i>in12</i> = <i>hardm_input</i>	status of the - hardware limit input,										
<i>in13</i> = <i>switch0_input</i>	status of the home cam input,										
<i>in14</i> = <i>move_en</i>	feed authorization command,										
<i>in15</i> = <i>exec_en</i>	execution authorization for programs.										

5.4.2 Logic Outputs

Click on Inputs / Outputs and select the Logic Outputs tab to open the following window:



This environment is used to manage logic outputs.

For each logic output, the following entries must be filled in:

Progr.	Establishes the connection between the level programmed on the logic output and the physical connector. [Corresponding Parameters: <i>m_out0</i> to <i>m_out7</i> = 0]
Force	Forces the corresponding level of the logic output to the "Forcing Value" on the physical connector. [Corresponding Parameters: <i>m_out0</i> to <i>m_out7</i> = 1]
Forcing Value	Each logic output can be forced to 0 or to 1 by selecting the ☉ button for choice 0 or 1. [Corresponding Parameters: <i>f_out0</i> to <i>f_out7</i>] The forcing value is only taken into account if the Force option of the corresponding output is validated.

Initialization Value	Each logic output can be initialized at 0 or 1 by selecting ☒ 0 or 1. This initialization takes effect when the auxiliary supply is detected. [Corresponding Parameters: <i>init_out0</i> to <i>init_out7</i>]																										
Assignment	Logic outputs can be assigned to system variables. By default, they are <i>no system assignment</i>. [Corresponding Parameters: <i>a_out0</i> to <i>a_out7</i>] The following <i>system variables</i> can be assigned by logic outputs: <table> <tr> <td>0 = not assigned</td><td>default situation</td></tr> <tr> <td>1 = home_made</td><td>"home-made" info</td></tr> <tr> <td>2 = moving</td><td>current movement info (theoretical)</td></tr> <tr> <td>3 = in_position</td><td>position reached info</td></tr> <tr> <td>4 = move_end</td><td>end of movement info (theoretical)</td></tr> <tr> <td>5 = exec_on</td><td>program being executed info</td></tr> <tr> <td>6 = drive_ok</td><td>positioner drive info ok (relay ok + power present)</td></tr> <tr> <td>7 = brake_supplied</td><td>brake supplied info</td></tr> <tr> <td>8 = flag0</td><td>flag0 status</td></tr> <tr> <td>9 = flag1</td><td>flag1 status</td></tr> <tr> <td>10 = fatal_error</td><td>fatal error info</td></tr> <tr> <td>11 = fault</td><td>fault info</td></tr> <tr> <td>12 = cam_outx</td><td>cam logic variable (with x = number of the corresponding output: out0 ↔ <i>cam_out0</i>,...)</td></tr> </table>	0 = not assigned	default situation	1 = home_made	"home-made" info	2 = moving	current movement info (theoretical)	3 = in_position	position reached info	4 = move_end	end of movement info (theoretical)	5 = exec_on	program being executed info	6 = drive_ok	positioner drive info ok (relay ok + power present)	7 = brake_supplied	brake supplied info	8 = flag0	flag0 status	9 = flag1	flag1 status	10 = fatal_error	fatal error info	11 = fault	fault info	12 = cam_outx	cam logic variable (with x = number of the corresponding output: out0 ↔ <i>cam_out0</i> ,...)
0 = not assigned	default situation																										
1 = home_made	"home-made" info																										
2 = moving	current movement info (theoretical)																										
3 = in_position	position reached info																										
4 = move_end	end of movement info (theoretical)																										
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7 = brake_supplied	brake supplied info																										
8 = flag0	flag0 status																										
9 = flag1	flag1 status																										
10 = fatal_error	fatal error info																										
11 = fault	fault info																										
12 = cam_outx	cam logic variable (with x = number of the corresponding output: out0 ↔ <i>cam_out0</i> ,...)																										

5.4.3 Analog Input / Output

Click on *Inputs / Outputs* and select *Analog Input / Output* to open the following window:

This environment is used to manage analog input and output.

5.4.3.1 Input

Enter the data for the following fields:

<i>Units</i>	Edition field used to customize the analog input. The filling in of this field is optional. [Corresponding Parameter: <i>unit4</i>]
<i>Scale</i>	Enter the desired scale coefficient, expressed in <i>Units/Volt</i> . [Corresponding Parameter: <i>scale_ina</i>]
<i>Offset</i>	Enter any necessary offset settings, expressed in <i>Volts</i> . [corresponding parameter: <i>ina_offset</i>]
<i>Software Forcing</i>	By default, there is no software forcing: button ☉ set to <i>No</i> . To validate software forcing, set button to ☉ <i>Yes</i> and fill in the <i>Value</i> data entry field. [Corresponding Parameter: <i>m_ina</i> = 0 no forcing; = 1 forcing]
<i>Value</i>	Enter the required forcing value for the analog input, expressed in <i>Volt and in Units</i> . [Corresponding Parameter: <i>f_ina</i>]
<i>Assignment</i>	The analog input can be assigned to the following <i>system variables</i> : [Corresponding Parameter: <i>a_ina</i>] <i>0 = no assignment</i> <i>1 = ki_red</i> <i>2 = speed_att</i> <i>3 = speed_value</i> <i>4 = torque_value</i> default setting: the input can freely be used and configured using Basic_DM program current reduction coefficient applied to <i>i_red</i> speed attenuation coefficient speed instruction in speed drive mode torque instruction in torque drive mode

5.4.3.2 Output

Enter the data for the following fields:

<i>Units</i>	Edition field used to customize the analog output. The filling in of this field is optional. [Corresponding Parameter: <i>unit3</i>]
<i>Scale</i>	Enter the desired scale coefficient, expressed in <i>Volt/Units</i> . [Corresponding Parameter: <i>scale_outa</i>]
<i>Initialization Value</i>	Enter the value, expressed in <i>Volt and in Units</i> , that will be taken by the analog output at initialization. This initialization takes effect when the auxiliary supply is detected. [Corresponding Parameter: <i>init_outa</i>]
<i>Software Forcing</i>	By default, there is no software forcing: button ☉ set to <i>No</i> . To validate software forcing, set button to ☉ <i>Yes</i> and fill in the <i>Value</i> data entry field, expressed in <i>Units</i> . [Corresponding Parameter: <i>m_outa</i> = 0 no forcing; = 1 forcing]
<i>Value</i>	Enter the required forcing value for the analog output, expressed in <i>Volt and in Units</i> . [Corresponding Parameter: <i>f_outa</i>]
<i>Assignment</i>	The analog output can be assigned to the following <i>system variables</i> : [Corresponding Parameter: <i>a_outa</i>] <i>0 = no assignment</i> <i>1 = pos1</i> <i>2 = pos2</i> <i>3 = pos_th</i> <i>4 = tracking_error</i> <i>5 = speed1</i> <i>6 = speed2</i> <i>7 = speed_th</i> <i>8 = synchro_error</i> <i>9 = i_setpoint</i> <i>10 = uf0</i> <i>11 = uf1</i> <i>12 = ui0</i> default setting: the output can freely be used and configured using Basic_DM program real position of controlled axis position of measured axis position setpoint tracking error real speed of controlled axis speed of measured axis speed setpoint synchronized speed error current setpoint user variable user variable user variable

	13 = <i>ui1</i>	user variable
	14 = <i>ina</i>	analog input, post-mask status
	15 = <i>cam_outa</i>	cam analog variable
	16 = <i>torque_setpoint</i>	torque set-point
	17 = <i>var0</i>	physical variable
	18 = <i>var1</i>	physical variable
	19 = <i>filter0</i>	filtered variable
	20 = <i>filter1</i>	filtered variable

5.4.4 Encoder Input/Output

Pressing the Inputs / Outputs button and selecting the *Encoder Input/Output* tab leads to the following window:

Inputs / Outputs parameters - Subscriber 12

Logic inputs | Logic outputs | Analog Input / Output | **Encoder input / output**

Option card

☒ No option

☐ Incremental encoder input

☐ Incremental encoder emulation

☐ Sincos encoder input

Caution! Device must be re-started before changes in option card selection are taken into account

Encoder emulation

Resolution: 1024 pulse/rev.

0 signal acknowledged

Zero marker

Encoder input

Encoder Resolution: 1024 pulse/rev.

Units / encoder revolution: 4096 unit2/rev.

☐ Reverse pulses counting direction

Units: unit2

☐ Apply the specified modulo

Modulo upper threshold: 100000 unit2

Modulo lower threshold: -100000 unit2

OK Cancel

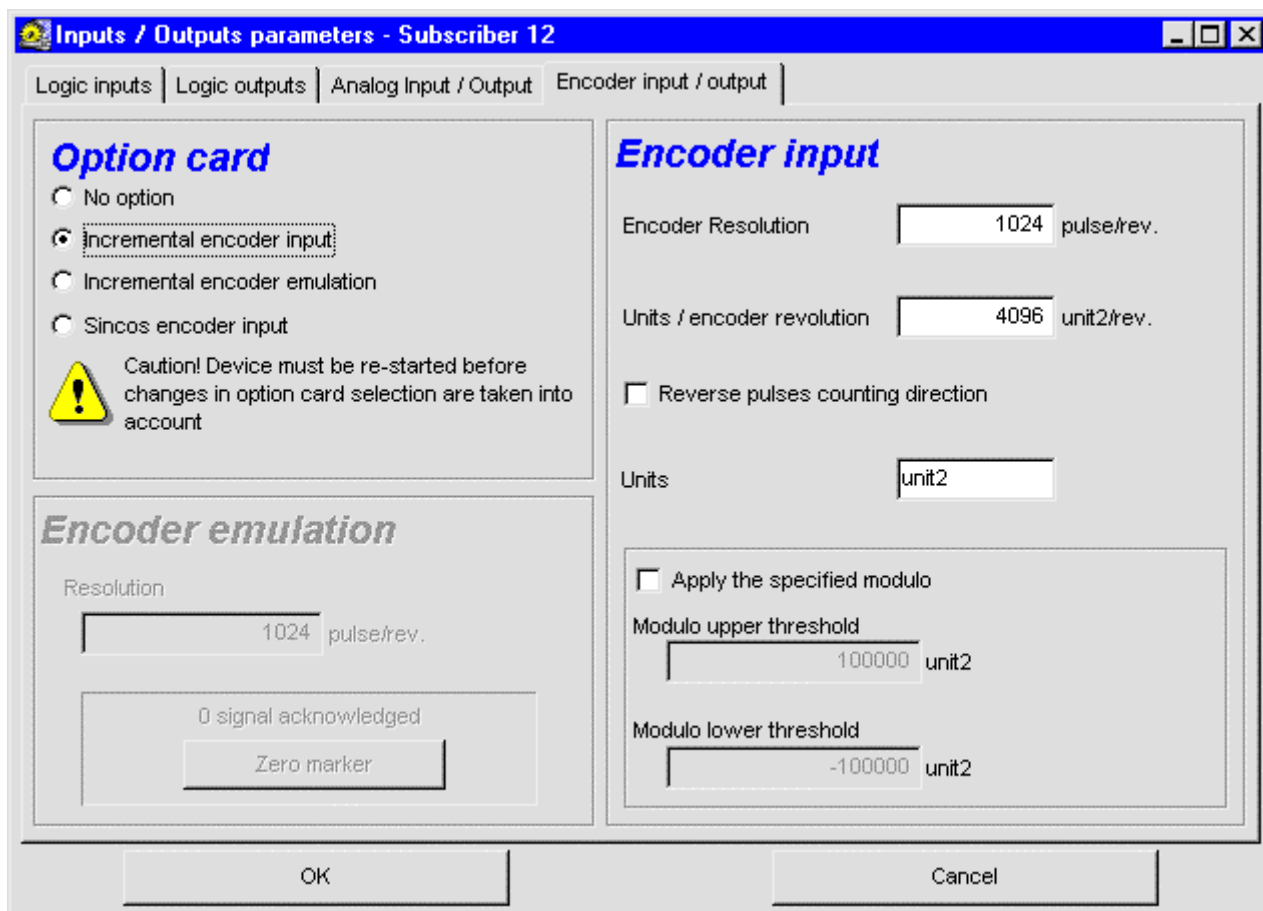
This environment is used to manage option cards.

Depending on the option card placed in the drive, set the  button to:

<i>No Option</i>	Default setting for this button  [Corresponding Parameter: <i>option_card</i> = 0]
<i>Incremental encoder input</i>	Select this option when an SC6638 incremental encoder input card is installed [corresponding parameter: <i>option_card</i> = 1]
<i>Incremental encoder emulation</i>	Select this option when an SC6639 incremental encoder emulation card is installed [corresponding parameter: <i>option_card</i> = 2]
<i>SinCos encoder input</i>	Select this option when an SC6645 SinCos encoder input card is installed [corresponding parameter: <i>option_card</i> = 3]

5.4.4.1 Incremental encoder input

Inputs / Outputs button, Encoder Input/Output tab, position  for Incremental encoder Input:



Inputs / Outputs parameters - Subscriber 12

Logic inputs | Logic outputs | Analog Input / Output | **Encoder input / output**

Option card

☐ No option

☒ Incremental encoder input

☐ Incremental encoder emulation

☐ SinCos encoder input

 Caution! Device must be re-started before changes in option card selection are taken into account

Encoder emulation

Resolution: 1024 pulse/rev.

0 signal acknowledged

Zero marker

Encoder input

Encoder Resolution: 1024 pulse/rev.

Units / encoder revolution: 4096 unit2/rev.

☐ Reverse pulses counting direction

Units: unit2

☐ Apply the specified modulo

Modulo upper threshold: 100000 unit2

Modulo lower threshold: -100000 unit2

OK Cancel

This environment validates the *Incremental encoder input* option. Set the parameters in the following data fields:

<i>Encoder Resolution</i>	Enter the number of <i>pulses/Resolution</i> for the encoder being used in this edition zone. The value is expressed in whole units. [Corresponding Parameter: <i>res_encoder</i>]
<i>Units</i>	Specify the unit used for the application. If the "position control by external encoder" function is selected (<i>Operating Modes</i> window, <i>Set-up</i> tab), the unit declared under unit2 is the same as unit1. The box is then shaded. [Corresponding Parameter: <i>unit2</i>]
<i>Units / Encoder Resolution</i>	Enter the correspondence coefficient between the <i>encoder rotation</i> and <i>displacement units</i> . [Corresponding Parameter: <i>kunit_encoder</i>]
<i>Inverse the Pulse Counting Direction</i>	Check ☒ this cell to inverse the direction of the pulse counting carried out by the calculator. [Corresponding Parameter: <i>encoder_inv</i>] This option is especially useful in the debugging phase: It avoids having to physically inverse the return of encoder data.

Acknowledgement of a modulo

Modulo operation consists in bringing the positional value of the measured axis within a given interval. This is typically used with rotary axes or axes with no physical limits, which move indefinitely in the same direction.

When the user checks ☒ the "Apply the specified modulo" box ☐ the system takes into account the upper and lower limits stated.

Let's take as an example a 360° rotary axis. If the user selects a lower limit of -180° and an upper limit of +180°, the axis position will always be between -180° and +180° whatever the cumulative movements made by the axis. The measured positions will be taken to be "modulo 360°". (The modulo corresponds to the difference *upper limit - lower limit*.) The "Apply the specified modulo" option means the user does not need to control the equivalence relation between the absolute positions -180° and +180°. Applying a modulo with an upper limit of +180° and a lower limit of -180° to the value of 470° returns 110° (470° - n times the modulo, where n = 1); applying it to a value of -200° returns +20° (-200° + n times the modulo, where n = 1).

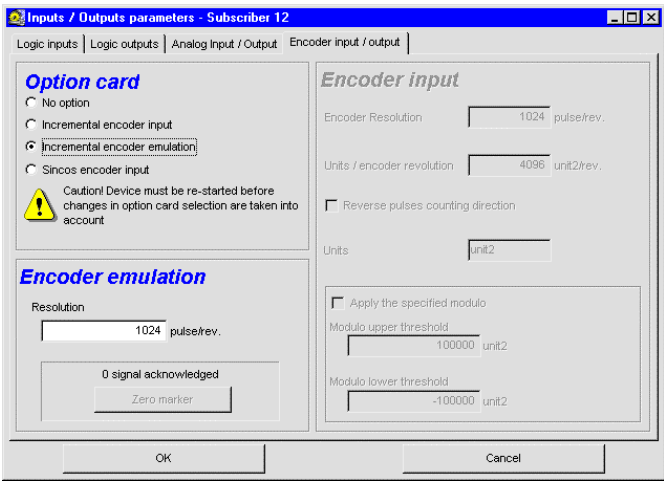
The modulo function also makes it possible to avoid reaching the maximum counting capacity of the system. Unless otherwise specified by the user, the system will apply of its own accord and as a safety measure a modulo with an upper limit of 10000000 unit2 (or 100000000 encoder transitions) and for the lower limit a lower limit value of -10000000 unit2 (or -100000000 encoder transitions).

Tip: the modulo upper limit and modulo lower limit values must correspond to a complete number of encoder increments or encoder emulation increments so as to avoid losing left-overs from division.

Apply specified modulo	Check ☒ this box to validate the modulo specified by the upper limit and lower limit fields below. [corresponding parameter: <i>modul2_en</i>] If this box is not checked, the system modulo will be applied.
Modulo upper limit	Enter the value of the upper threshold of the modulo in this field. [corresponding parameter: <i>modul2_up</i>]
Modulo lower limit	Enter the value of the lower threshold of the modulo in this field. [corresponding parameter: <i>modul2_low</i>]

5.4.4.2 Incremental encoder emulation

Inputs / Outputs button, Encoder Input/Output tab, position ☉ for Incremental Encoder Emulation:



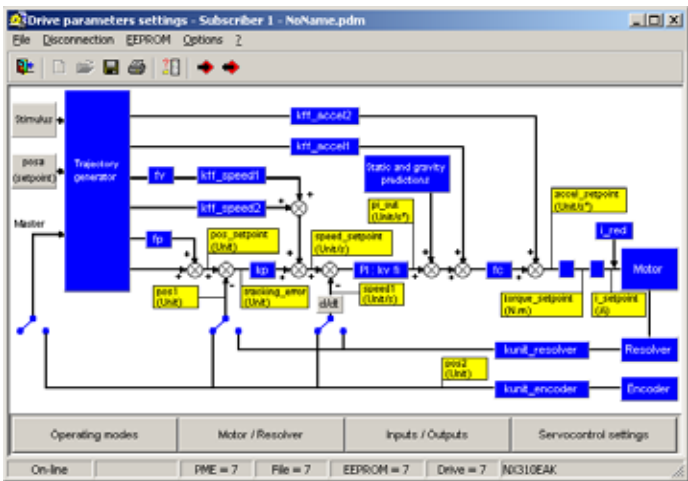
Th This environment validates the *Incremental encoder emulation* option. Set the parameters in the following data fields:

<i>Resolution</i>	In this edition field, enter the selected resolution for the "Encoder Emulation" function in <i>pulses / motor resolution</i> , expressed in whole units selected from the range [1 ...16384]. [Corresponding Parameter: <i>Encoder_Resolution</i>]
<i>Acknowledgement of top 0</i>	First, set the kinematics to the desired position: future co-ordinate being 0 for the absolute marker. The status must be <i>ON LINE</i> . Press the <i>Top 0</i> button to validate the acknowledgement of the 0 timing signal on a rotation of the resolver. Comment: The 0 timing signal must be re-entered every time the resolution is changed.

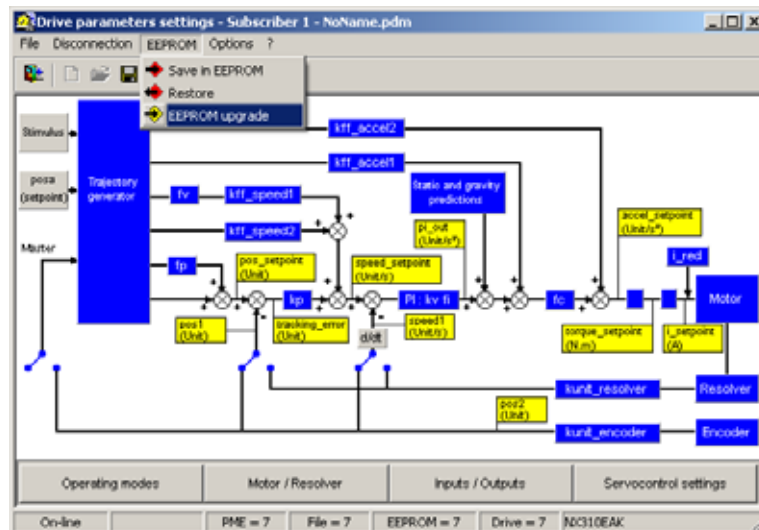
5.4.4.3 SinCos encoder input

5.4.4.3.1 Setting parameters for a drive fitted with a SinCos encoder:

All parameters are set using PME software via the *Drive parameters Settings* window.



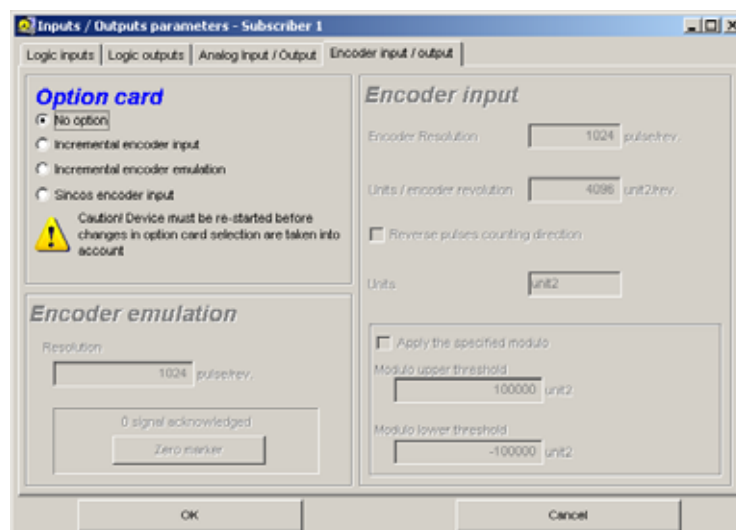
- Global transfer of the parameters from an *.fdm file, if it has been created.
IF THIS IS NOT THE CASE
- Upgrade the set of EEPROM parameters so that the SinCos option appears in the *Inputs / Outputs* window.



The parameter setting procedure consists of the following 4 stages:

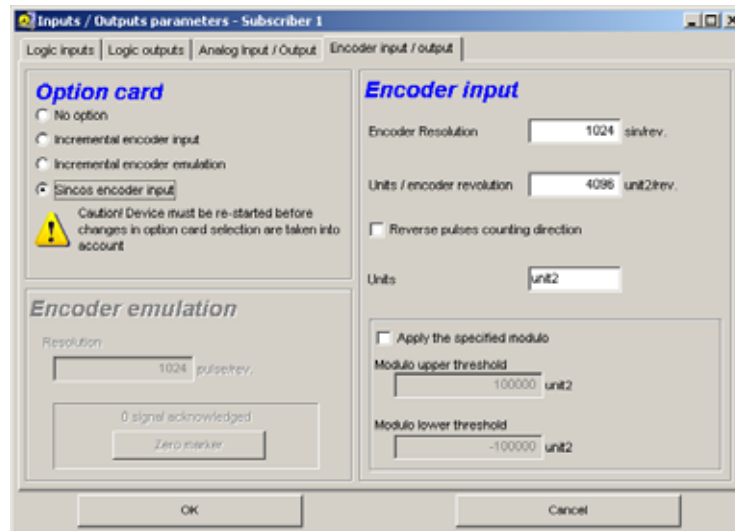
5.4.4.3.1.1 Validating the SinCos encoder input:

- Pressing the *Inputs / Outputs* button and selecting the *Encoder Input / Output* tab leads to the following window:



This environment is used to manage option cards.

- Validate the *Sincos encoder input*:

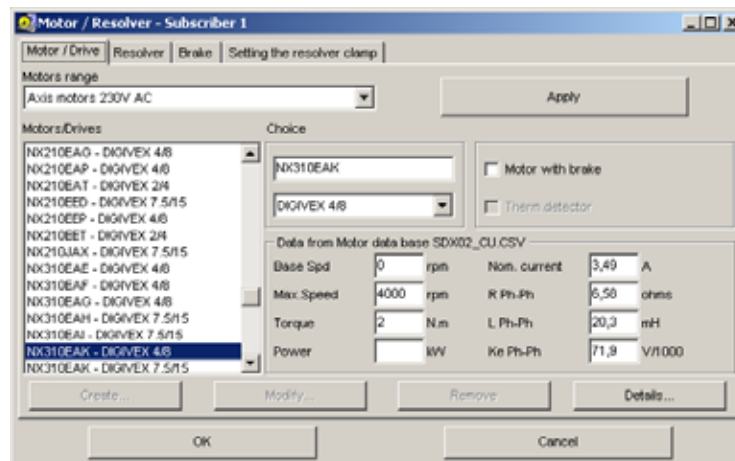


This environment validates the *SinCos encoder input* option. Set the parameters in the *Encoder resolution* and *Units / encoder revolution* data fields. The *Encoder Resolution* is expressed in sinusoids per revolution (*sin/rev*).

- Click on OK to validate the SinCos input.

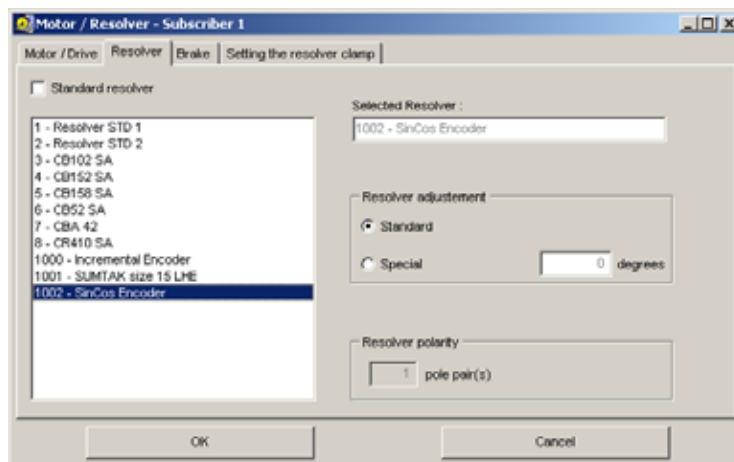
5.4.4.3.1.2 Validating the motor + SinCos encoder:

- Clicking on the Motor / Resolver button opens the following window:



- Select the Motor / Drive association from the motor database.
- Apply.
- Next, select the Resolver button.

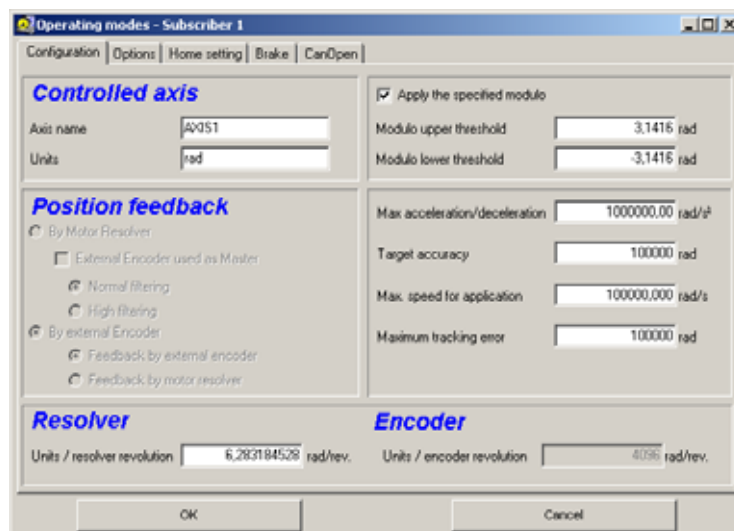
This, then leads to the following window:



- Uncheck the *Standard Resolver* data field and select *1002-SinCos Encoder* as shown above.
- Click on OK.

5.4.4.3.1.3 Validating the automatic control option:

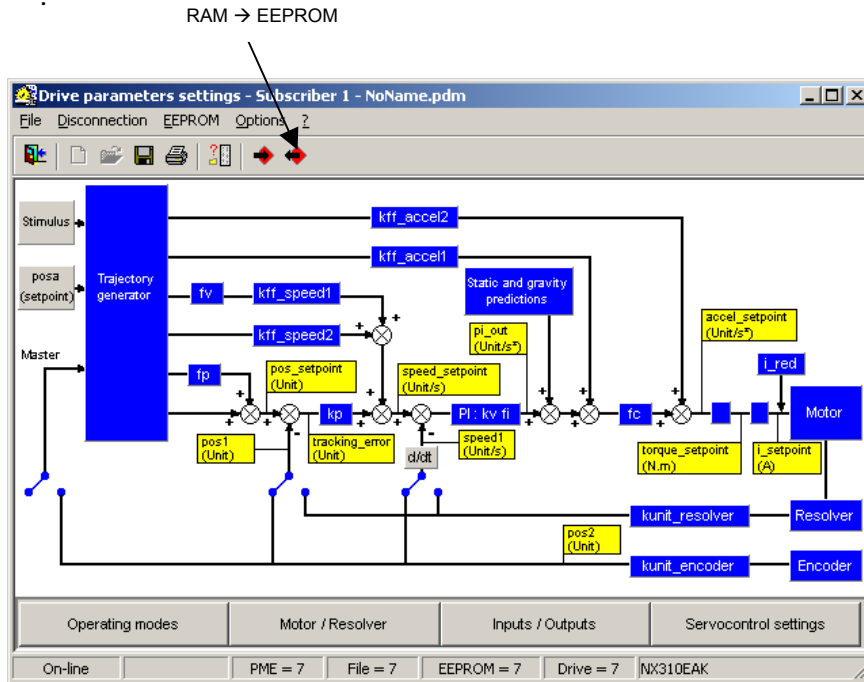
- Clicking on the *Operating modes* button opens the following window:



- Then, in the *Position feedback* section, check the:
 - By external encoder
 - Speed return by external encoder data fields.
- Set the parameters in the other sections of the window.
- Press OK.

5.4.4.3.1.4 Saving the parameters:

- Save the parameters in an *.fdm parameter file.
- Click on the *RAM* ---> *EEPROM* button to save the drive configuration



- Shutdown the drive to restart in SinCos mode.

5.4.4.3.2 Setting the SinCos balance parameters:

These parameters are to be set once when on-site energizing first takes place.

The SINCOS encoder unit (mechanical assembly) + cable + SINCOS SC6645 encoder input card can generate:

- Sine and Cosine signal offsets.
- different amplitudes between the Sine and Cosine signals.

and consequently a significant position error (speed ripple).

An automatic program is used to equalize the Sine and Cosine channel offsets and to correct the Sine and Cosine channel amplitudes; the highest amplitude is set to the level of the lowest. Amplitudes are corrected insofar as **the Sine Amplitude / Cosine Amplitude ratio is between 0.9 and 1.1.**

5.4.4.3.2.1 Constraints:

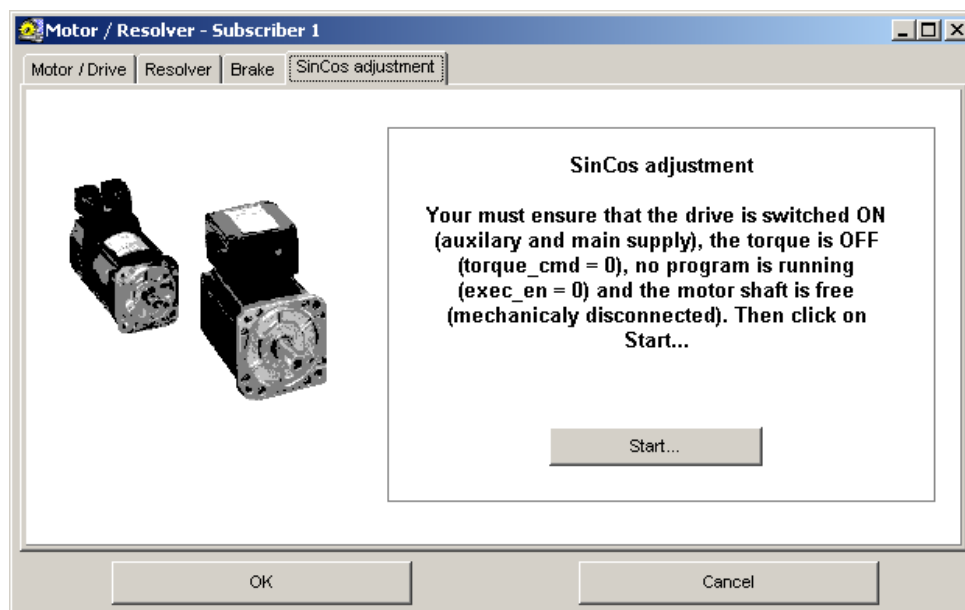
This program can only operate with:

- Firmware greater than or equal to **AP704V08**.
- PME software greater than or equal to **PME 4.06**.
- The SinCos encoder unit (mechanical assembly) + cable + SINCOS SC6645 encoder input card form a combined unit once the parameters are set. Reset the parameters if one of these elements changes.

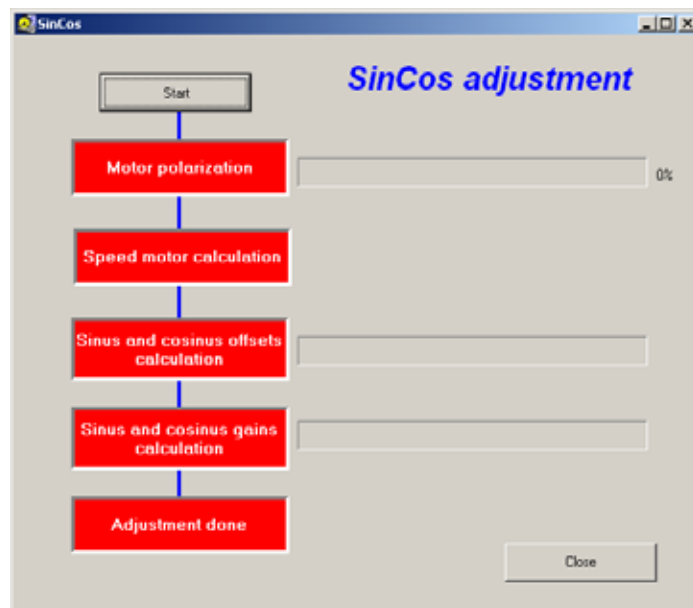
5.4.4.3.2.2 Starting the program:

This program is to be found under the parameter editor:

- Click on *Motor / Resolver*.
- Select the *SinCos adjustment parameters* button.

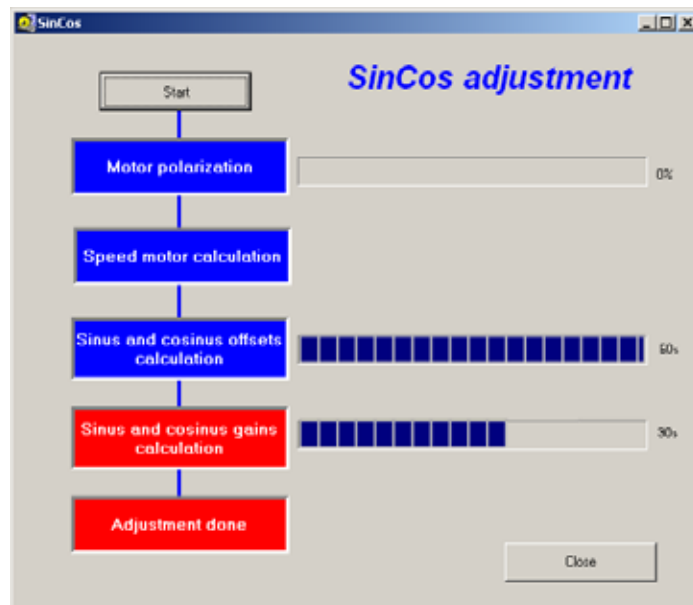


- Next, click on *Start...*



- Click on *Start*.

The parameter setting program then runs:



- Click on *Close* when parameter setting is completed; *Adjustment done* then appears in blue.

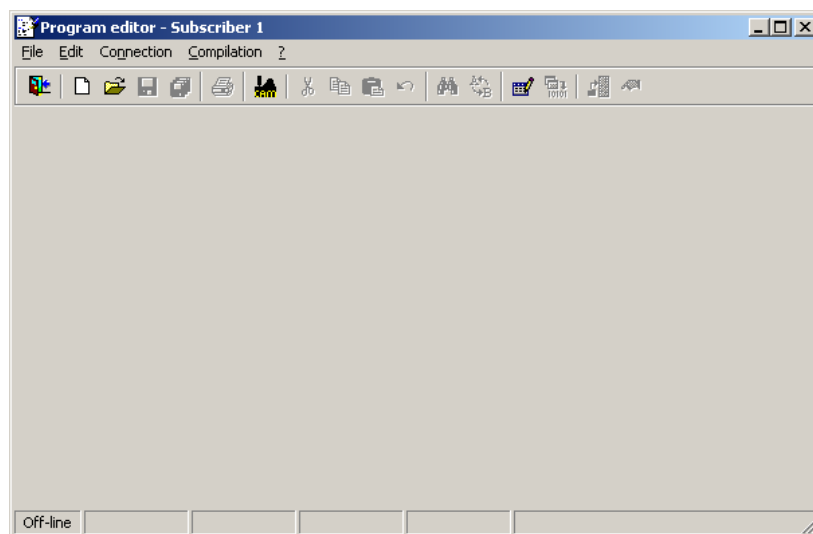
Parameter setting takes approximately 3 minutes.

5.4.4.3.3 Home setting position:

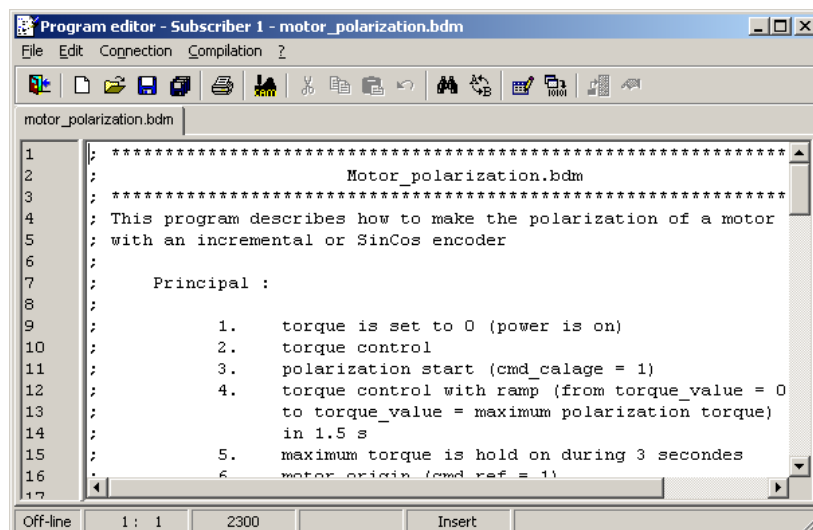
It is necessary to calibrate the motor every time the drive is energized in order to guarantee the control of said speed drive as the encoder is not absolute on a revolution.

Polarization of the motor is carried out via a *Motor_polarization.bdm* user program that is to be found under C:\Program File\Parvex\PME4.xx\App_parvex\Example\Miscellaneous.

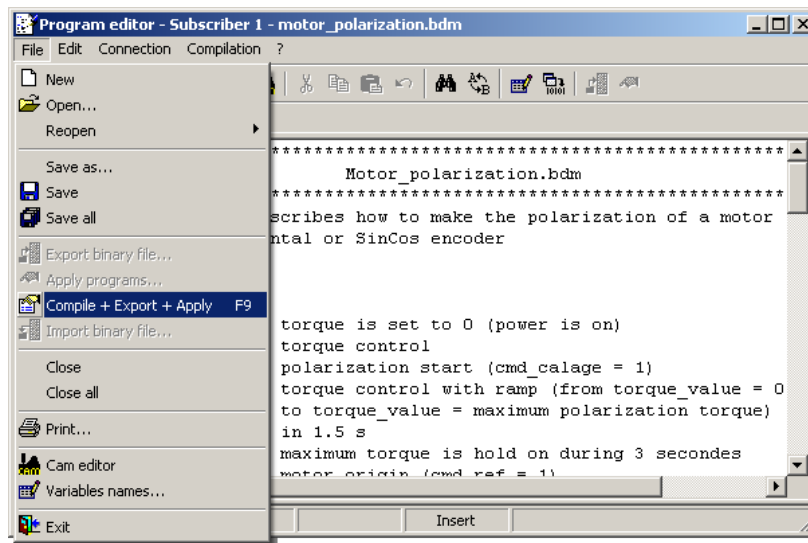
- Start the *Program editor* tool:



- Click on Connection.
- Load the user program C:\Program File\Parvex\PME4.xx\App_parvex\Example\Misc\Motor_polarization.bdm by clicking on File \ Open.



- Compile + Export + Apply as shown below:

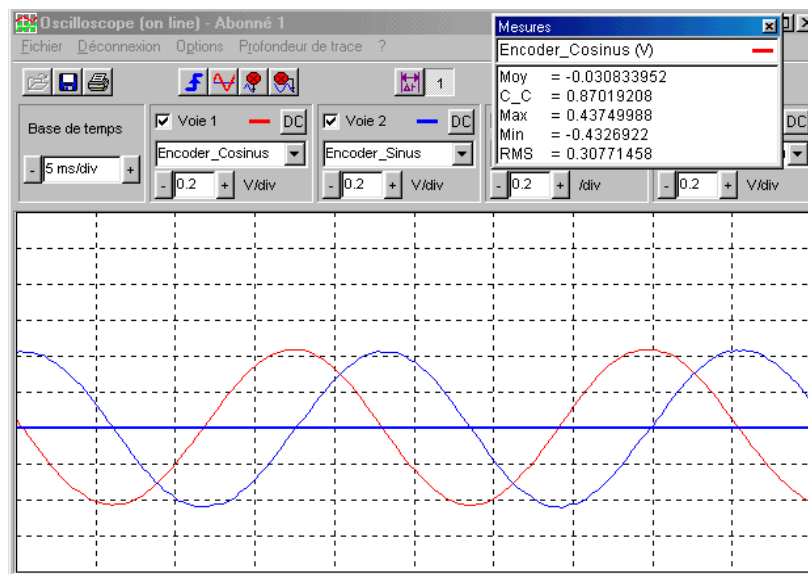


- Exit the window.
- Turn the power on if it has not been done.
- Start the user program by validating the `exec_en = 1` variable and by putting in7 = 1. The calibration is completed when `out7 = 1`. The user program can then be stopped by putting `exec_en = 0`.

5.4.4.4 Oscilloscope variables

Sine & Cosine encoder signals can be observed via the PME oscilloscope.
This involves using variables:

- Encoder_Sinus → Sine Signal.
- Encoder_Cosinus → Cosine Signal.



5.5 Servocontrol Settings

5.5.1 Servocontrols

Click on *Setting Servocontrols* and select the *Servocontrol* tab to open the following window:

This environment gives individual* access to all servocontrol parameters.

(*) the procedure of assisted setting, as described in the following pages, sets all parameters globally. This setting assistant should be used as a matter of priority.

The user is then able to separately modify each parameter when the application requires a specific setting to obtain:

- a pre-determined performance level,
- an optimized filtering of resonances,
- etc.

Parameters are grouped by function family:

5.5.1.1 Position

<i>Gain</i>	This is proportional gain in position of the servocontrols, expressed in 1/s. [Corresponding Parameter: <i>kp</i>]
-------------	--

5.5.1.2 Speed

<i>Gain</i>	This is proportional gain in speed of the servocontrols, expressed in 1/s. [Corresponding Parameter: <i>kv</i>]
<i>Integral Stop</i>	Corresponds to the stop frequency of the integral action, expressed in Hz, of the speed servocontrol (Resonance frequency damping). [Corresponding Parameter: <i>fi</i>]
<i>Filter</i>	This parameter determines the crossover frequency, expressed in Hz, of the second order filtering. [Corresponding Parameter: <i>fc</i>]

5.5.1.3 Feed Forward

This parameter family groups together the settings for anticipative actions.

<i>Controlled Acceleration</i>	Corresponds to the acceleration anticipation coefficient for the controlled movement. When the settings are optimized, the coefficient equals 1 and represents 100 % anticipation. [Corresponding Parameter: <i>kff_accel1</i> included between 0 and 1.5]
<i>Master Acceleration</i>	Corresponds to the acceleration anticipation coefficient for the master movement. In a Master– Slave configuration, when the settings are optimized, the coefficient equals 1 and represents 100 % anticipation. [Corresponding Parameter: <i>kff_accel2</i> included between 0 and 1.5]
<i>Controlled Speed</i>	Corresponds to the speed anticipation coefficient for the controlled movement. When the settings are optimized, the coefficient equals 1 and represents 100 % anticipation. [Corresponding Parameter: <i>kff_speed1</i> included between 0 and 1.5]
<i>Master Speed</i>	Corresponds to the speed anticipation coefficient for the master movement. In a Master– Slave configuration, when the settings are optimized, the coefficient equals 1 and represents 100 % anticipation. [Corresponding Parameter: <i>kff_speed2</i> included between 0 and 1.5]
<i>Position Delay</i>	This is a second order filtering whose crossover frequency (<i>fp</i>) is expressed in Hz. Its role is to delay the position setpoint in order to optimize the speed prediction action. [Corresponding Parameter: <i>fp</i>]
<i>Speed Delay</i>	This is a second order filtering whose crossover frequency (<i>fv</i>) is expressed in Hz. Its role is to delay the speed setpoint in order to optimize the speed prediction action. [Corresponding Parameter: <i>fv</i>]

5.5.1.4 Predictors

<i>Friction</i>	Corresponds to the friction prediction value expressed in N.m. [Corresponding Parameter: <i>f_static</i>]
<i>Threshold</i>	Corresponds to the speed threshold above which the friction prediction is saturated to the value of <i>f_static</i> . The threshold is given as a percentage of the <i>speed_max</i> maximum speed. [Corresponding Parameter: <i>threshold</i>]
<i>Gravity</i>	This is the gravity force prediction value applied to the axis. It is expressed in N.m. [Corresponding Parameter: <i>gravity</i>]

5.5.1.5 Inertias

<i>Load</i>	This parameter corresponds to the load inertia applied to the motor, expressed in kg.m^2 . [Corresponding Parameter: load_inertia]
<i>Motor</i>	Indication of the inertia of the motor, expressed in kg.m^2 . [Corresponding Parameter: motor_inertia]
<i>Brake</i>	Indication of the inertia of the brake (when one is installed on the motor), expressed in kg.m^2 . [Corresponding Parameter: brake_inertia]
<i>Total</i>	Indication of the total inertia of the movement applied to the motor, expressed in kg.m^2 . [Corresponding Parameter: inertia]

5.5.1.6 Current

<i>Limitation</i>	Corresponds to the motor current limitation parameter, expressed in A. [Corresponding Parameter: i_red]
-------------------	--

If excessive RMS or average current, then :

<i>Stop and pass to Fault</i>	Click ☹ on this button to trigger a fault of the drive, when a current overload is detected. [Corresponding Parameter: overload_management = 0]
<i>Continue with Reduction Current</i>	Click ☺ on this button to limit the acceptable permanent current to 90% when a current overload is detected. [Corresponding Parameter: overload_management = 1]

5.5.1.7 Comments

- When all values are correctly entered, click on .
- It is strongly recommended that the user create an overall parameter file on diskette and/or hard drive, when the following software environments:
 - *Operating Modes*,
 - *Motor / Resolver*,
 - *Inputs / Outputs*,
 - *Servocontrol Settings*,

belonging to the *Drive Parameter Settings* window will have been completely explored.

To do this, use function:

- *File / Save* or
- *File / Save As*.

- A global transfer of all the parameters to the EEPROM (supplementary request required) and the RAM of the drive can then be carried out using the function:
 - *Global Transfer*.

5.5.2 Setting Calculation

Click on *Servocontrol Settings* and select the *Setting Calculation* tab to open the following window:

This environment is used to:

- automatically calculate a set of parameter settings,
- apply the set of parameters suggested by the software program to the positioner drive.

To do this, the following data must be entered:

- *Gain in position*, [Corresponding Parameter: k_p expressed as s^{-1}]
- *Load inertia* (if possible).

The *Maximum Achievable Acceleration* and *Maximum Achievable Speed* boxes are for guidance only. They show the maximum values of the `accel_max` and `speed_max` parameters (*Operating Mode* window).

5.5.2.1 Operating Mode

- 1] When the window is opened, the gain in position k_p is set at $62 s^{-1}$. It corresponds to a passing band at a 10 Hz position. This setting, default, should be accepted by most applications.

The user can select the gain in position that he wishes to apply by clicking on + or – in the *Gain in position* data entry window or by directly entering a value using the keyboard.
[Corresponding Parameter: k_p expressed as s^{-1}]

- 2] If possible, enter the values for *Minimum Inertia* and *Maximum Inertia* which correspond to the probable load inertia, expressed in $kg.m^2$.

Comments:

- The considered load inertia is applied to the motor.
- The default values correspond to a *Minimum Inertia* of zero and a *Maximum Inertia* equal to 4 times the inertia of the motor.

3] The user selects if he wishes to use the "acceleration and speed prediction" function. If yes, check✓ the *Use Feed Forward* cell and only enter the value for the *Exact Inertia* cell, expressed in $kg.m^2$. The value entered must be as exact as possible because the precision of the prediction is based on this value.

4] When all the data is entered, the software program calculates the various servocontrol parameters k_v , f_i , f_c , f_v , f_p and displays them in the lower part of the window.

5.5.2.2 Application of proposed settings

The user can apply the set of suggested parameters by clicking on the *Apply settings* button.

Comment:

The settings cannot be applied if a value is displayed in red in one of the fields. Values are displayed in red when the calculation is judged to exceed the limits set by the software program. Certain combinations of gain in position and declared inertias are prohibited.

5.5.2.3 Assessment of results

The user is invited to use both the *Stimuli Generator* tool and the *Oscilloscope* function in order to observe the development of variables while settings are being applied. (Refer to the use of various tools expressed in section 4.)

Stimuli Generator tool

The programmed stimulus must be able to create a sufficient movement and requires a significant current, without however, causing a saturation of current.

Important !

Before any movement commands: First make sure that the machine can operate without endangering personnel and that no equipment will be damaged.

Oscilloscope Function

Screen display:

- | | |
|-----------------------------|---|
| • speed setpoint | [<i>speed_setpoint</i>] |
| • speed measurement | [<i>resol_speed</i> or <i>speed1</i>] |
| • speed regulator PI output | [<i>pi_out</i>] |

5.5.2.4 Finding the optimal setting

General Case (without using Feed Forward)

For a given *Gain in position (kp)*, the given range [*Min. Inertia, Max. Inertia*] is optimal when:

- the *resol_speed* speed measurement follows the *speed_setpoint* speed setpoint without any transient or sustained oscillations.
- the delay of the speed measurement in relation to the speed setpoint remains acceptable.

The output of the *pi_out* speed regulator:

- is not saturated in acceleration and deceleration phases,
- does not oscillate at a high frequency at the end of movement.

A *kp* gain in position that is too high rapidly causes an instability of the servocontrol.

A *kp* value that is too weak makes the system too "soft" and causes a large tracking error [Corresponding Parameter: *tracking_error*].

Using the Feed Forward prediction function

The output of the *pi_out* speed regulator is the image of an acceleration.

The *feed forward* prediction function is optimized when *pi_out* does not vary (or very little) during acceleration and deceleration phases. This result is obtained when the entered *Exact Inertia* converges towards the real value of the load inertia.

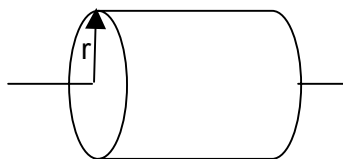
- For a vertical axis that is subject to gravity acceleration, *pi_out* shows a value that is approximately constant and not equal to zero.
- For a horizontal axis, the *pi_out* output leans towards zero when the prediction is "perfect".

Increasing the kp gain in position

When the inertia range [*Min. Inertia, Max. Inertia*] or even the *Exact Inertia*, is correctly determined, the *kp* gain can be increased in order to try to improve the dynamic performances.

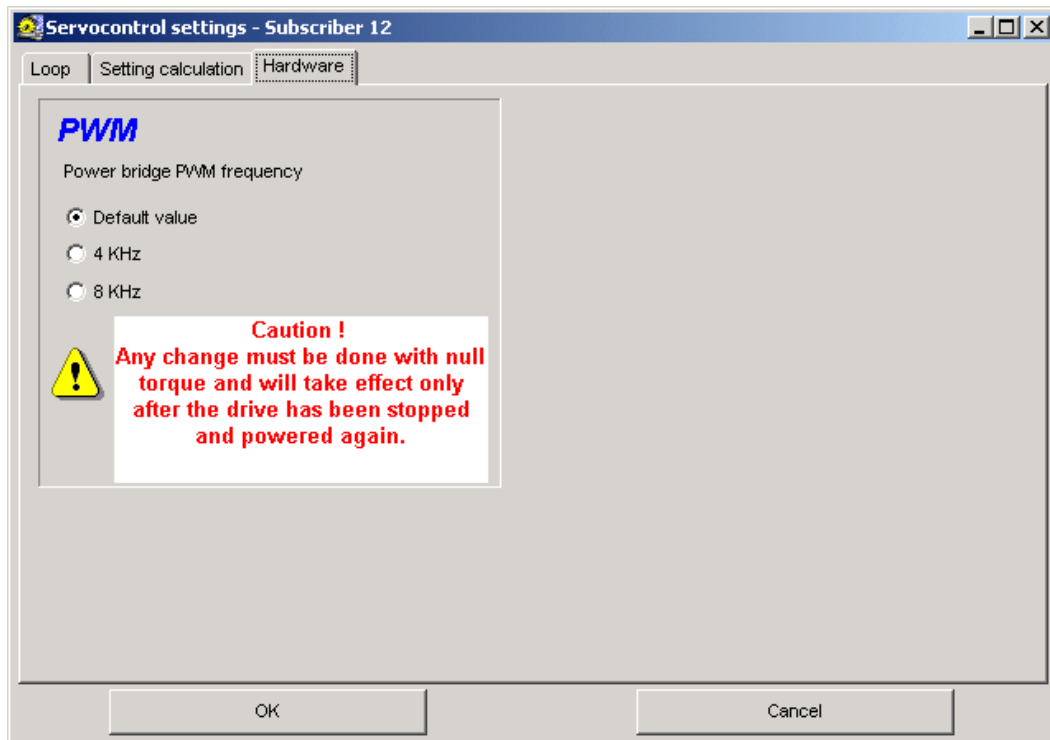
5.5.2.5 Calculating Inertia

Cylinder : $J = \frac{1}{2}mr^2$



m=mass (inKg)
r= radius (in m)

5.5.3 Hardware



This page is used for modifying the power bridge cutting frequency. This functionality is used as a solution in cases of long length cables.



The 8kHz frequency selection, suggested by default, should not be modified without just cause.

Keep the default selection for standard applications: ☒ Default value

6. TOOLS

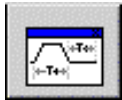
6.1 Main System Variables

The table below lists the main system variables that are available when using the oscilloscope or the variable watcher. These variables are displayed in the drop-down lists of the related tools and are listed in alphabetical order.

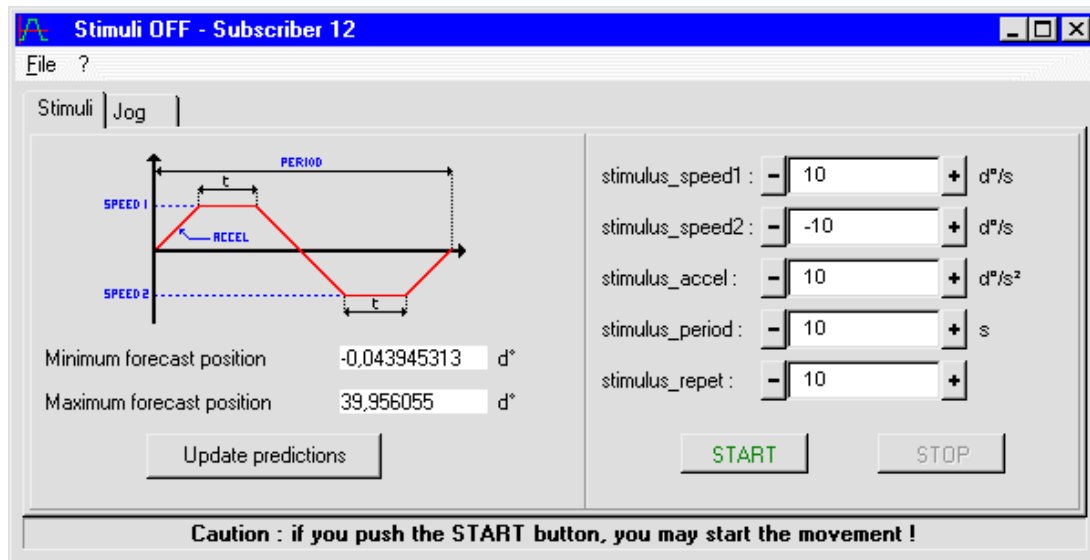
The complete list of accessible variables can be found in the DIGIVEX Motion "PVD 3527 - Directory of variables" Manual.

	Name	Description
Positions	posa	Absolute destination position (controlled by the program), in unit1
	pos_setpoint	Current position setpoint (movement controlled by the program), in unit1
	pos1	Real position of axis 1 (controlled axis: motor resolver or external encoder), in unit1
	pos2	Real absolute position of axis 2 (master axis, external encoder), in unit2
	tracking_error	Current tracking error, in unit1
Speed	speed_setpoint	Current speed setpoint (controlled movement), in unit1/s
	speed1	Real speed of axis 1 (motor), in unit1/s
	speed2	Real speed of axis 2 (external encoder), in unit2/s
	speed_error	Speed error, in unit1/s
Acceleration Torque Current	pi_out	PI regulator output, in unit1/s ²
	accel_setpoint	Acceleration setpoint, in unit1/s ²
	torque_setpoint	Torque setpoint, in N.m
	i_setpoint	Current setpoint, in A
Inputs Outputs	ina	Value of analog input
	outa	Value of analog output
	in0 to in15	Status of logic inputs
	out0 to out7	Status of logic outputs
User Variables	ub0 to ub127	User logic variables
	ud0 to ud63	User floating variables (high precision, 40 bits)
	uf0 to uf191	User floating variables (normal precision, 32 bits)
	ui0 to ui127	User whole variables (32 bits)
Motor Drive	thermic_drive_load	Thermal load of drive (100 % = permanent limit of the drive)
	thermic_motor_load	Thermal load of the motor (100 % = limit of permanent motor speed)
	heatsink_temp	Temperature of the radiator (heatsink) of the drive
	bus_voltage	Voltage of the intermediate circuit (internal bus voltage)
	Power	Power measured on the intermediate circuit (only available for DPM drives)

6.2 Stimuli Generator



From the *Network Management* environment and by clicking on a drive connected to the network (*ON LINE* status), click on *Stimuli Generator* to open the following window:



6.2.1 Stimuli Generator

The *Stimuli Generator* tool is used to generate a speed setpoint for the positioner drive. This is especially useful in the debugging phase when trying to set the servocontrols and check performances. It provides the means for simply moving the axis, without using positioning statement included in a user program.

The title bar of the window displays the status of the stimuli generator:

Stimuli OFF (Stimuli inactive) or *Stimuli ON* (Stimuli active) and the subscriber number of the positioner drive.

6.2.1.1 Required Parameters

<i>stimulus_speed1</i>	Enter the desired value in this field, expressed in <i>unit1/s</i> . Comments: - <i>stimulus_speed1</i> can be lower than <i>stimulus_speed2</i> . - Positive or negative values are authorized. - <i>unit1</i> is entered in the <i>Drive Parameter Settings</i> environment: Click on <i>Operating Modes</i> , select <i>Configuration</i> .
<i>stimulus_speed2</i>	Enter the desired value in this edition zone, expressed in <i>unit1/s</i> . Positive or negative values are authorized.
<i>stimulus_accel</i>	Enter the desired acceleration or deceleration level [in <i>unit1 /s²</i>], during speed transitions. Enter a positive value for this parameter.
<i>stimulus_period</i>	Enter the time period of the stimulus, expressed in <i>s</i> .
<i>stimulus_repet</i>	Enter the number of cycles (repetitions) to be carried out by the <i>Stimuli Generator</i> . The entered value must be included between 1 and 1 000 000.

6.2.1.2 Available Keys

Update Predictions	Press this key to calculate and display the displacement predictions: <i>Min. Forecast Position</i> and <i>Max. Position</i> , expressed in <i>unit1</i> .
START	This key runs the stimuli sequence. IMPORTANT: Make sure that the controlled axis meets all safety requirements before pressing this key! The following conditions are required for starting the <i>stimuli</i>: - power present, - no fault present, - no application programs are running, - the 7-segment display on the front panel of the unit must have a <i>blinking 1</i>. If these conditions are met: - the status bar displays the status as <i>ON</i>. - The <i>Min. Forecast Position</i> and <i>Max. Position</i> data, expressed in <i>unit1</i>, are updated. The <i>STOP</i> key becomes available.
STOP	This key interrupts the current stimuli sequence [<i>abort_cmd</i> = 1].

6.2.1.3 Comments

- On the figure illustrating a drive stimulus, t represents *SPEED1* or *SPEED2* a constant speed operating range. Its value is determined by the following calculation:

$$t = \frac{T - \Sigma t_{\gamma}}{2} \quad \text{where: } \Sigma t_{\gamma} \text{ represents the sum of the acceleration and deceleration times}$$

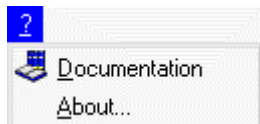
and

T the stimulus recurrence frequency.

t must always be positive or zero: in the event that this is not true, an error message shows T_{min} making t equal to zero.

- Motion cannot start when inconsistent values have been entered in the different data fields. The user is informed by an error message.
- When the *software running limits* are active, the software checks whether or not the anticipated displacement will lead to the overrunning of these *running limits*. Motion cannot start if the *running limits* are likely to be reached.

6.2.1.4 About...

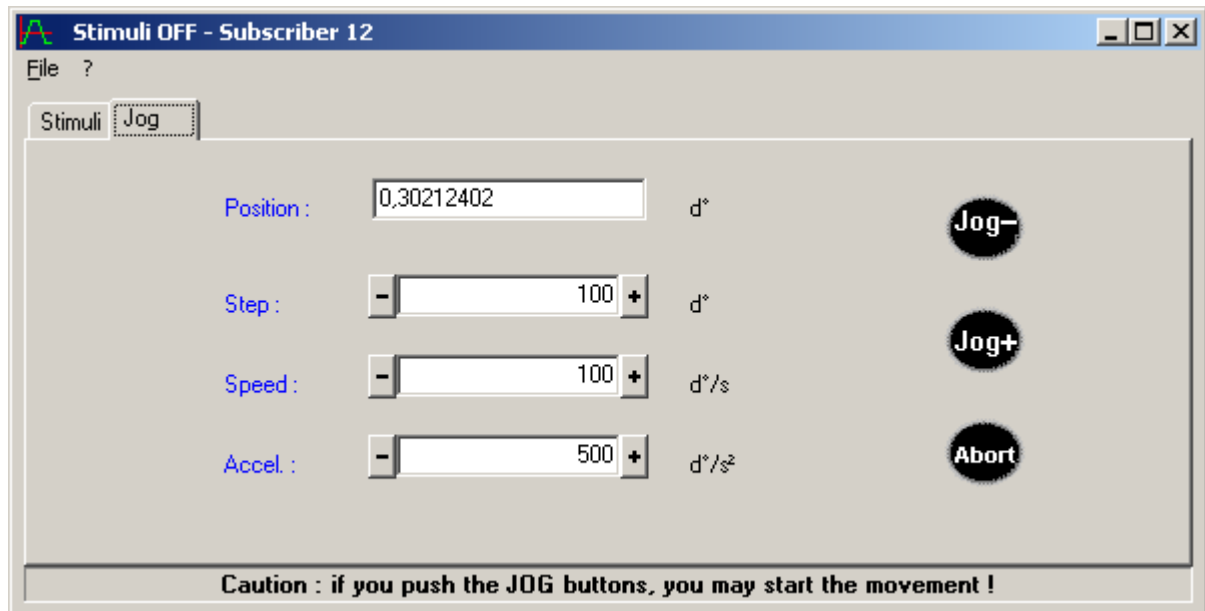


This menu gives access to the:

- PME software guide (Acrobat Reader PDF format)
- About... window and displays the version number of the current software

6.2.2 JOG Instruction

This tool generates a relative displacement. It is especially useful in the setting phase, where the user applies himself to servocontrol setting and performance checking. It provides the means to displace the axis simply, without using the positioning instructions making up a user program.



The "Position" window shows the real position of the axis [*pos1*]. This information is refreshed cyclically.

6.2.2.1 Parameters to be set

<i>Step</i>	Enter the desired relative displacement value, expressed in <i>unit1</i> , in this edition field <i>unit1</i> is set in the <i>Setting drive parameters</i> environment, select <i>Operating Modes, Configuration</i> tab Only positive values are authorised.
<i>Speed</i>	Enter the desired displacement speed value, expressed in <i>unit1/s</i> , in this edition field Only positive values are authorised.
<i>Accel</i>	In this field, enter the required acceleration / deceleration value, expressed in <i>unit1/s²</i> Only positive values are authorized.

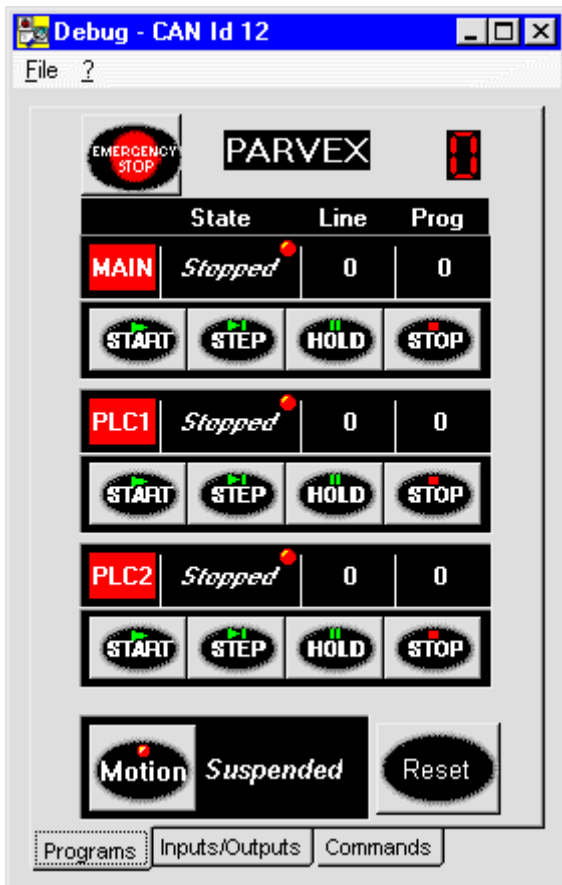
6.2.2.2 Available Keys

<i>Jog +</i>	This key starts displacement in the positive direction Caution: make sure that the controlled axis meets all safety requirements before pressing this key! The following conditions are required for starting the relative displacement: • power supply present, • no fault present, • no application program execution in progress, • the 7-segment display situated on the front of the unit must show a <i>flashing 1</i>.
<i>Jog -</i>	This key starts displacement in the negative direction Caution: make sure that the controlled axis meets all safety requirements before pressing this key! The following conditions are required for starting the relative displacement: • power supply present, • no fault present, • no application program execution in progress, • the 7-segment display situated on the front of the unit must show a <i>flashing 1</i>.
<i>Abort</i>	This key stops all displacement in progress [<i>abort_cmd</i> = 1].

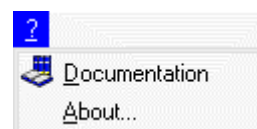
6.3 Execution Control (Debug)



From the *Network Management* environment and by clicking on a drive connected to the network (*ON LINE* status), pressing the key *Execution Control Tool* opens the following window:



The aim of this tool is to control the running of the selected positioner drive user programs. It would normally be used in design and test phases to ensure user programs (programs written in Basic_DM language: see DIGIVEX Motion "PVD 3517 - Programming Manual") are working correctly.



This menu gives access to the:

- PME software guide (Acrobat Reader PDF format)
- About... window and displays the version number of the current software

6.3.1 Program execution control

	This display repeats the state of the 7-segment display of the positioner drive. The various possible states are clarified in the section dealing with the <i>diagnostic assistance tool</i> .
	This key requests the emergency stoppage of all displacements in progress for the positioner drive concerned [<i>emergency_cmd</i> = 1].
	This key, via successive pressing, authorises or inhibits displacement [variable management <i>move_en</i>]: • "suspended" is shown if <i>move_en</i> = 0 • "enabled" is shown if <i>move_en</i> = 1
	This button is used to clear a current fault (fault shown on the 7-segment display). [<i>reset_cmd</i> = 1]

Program control is carried out by 3 similar modules:

- The "MAIN" module concerns the execution of motion control programs (main PROG0 program and subroutines).
- The "PLC1" module concerns the execution of the type 1 PLC program.
- The "PLC2" module concerns the execution of the type 2 PLC program.



"Line" and "Prog" zones show the position of the operation pointer for the module under consideration: showing the program line and number.

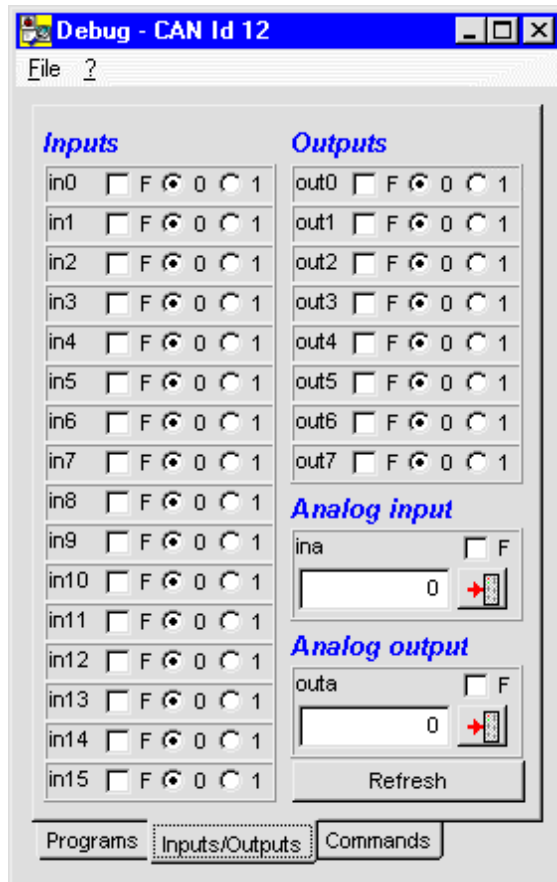
The "State" zone shows whether or not the module is running:

Running	Continuous execution of the program
Stopped	The program is stopped. Pressing on the "START" or "STEP" key will restart the program at the first line of the PROG0 program for the "MAIN" module, at the first line of the PLC program under consideration for "PLC1" and "PLC2" modules.
Stepping	This is the step by step mode: a step of the program is being carried out
Hold	This is the step by step mode: a step of the program has just been carried out. The "START" or "STEP" key must be pressed.

Execution control is carried out using the keys:

START	This key starts the continuous execution of the program. The instructions are sequenced automatically, one after another.
STEP	This key validates the execution of the program in step by step mode. Pressing this key allows only one single, elementary instruction to be carried out at a time (execution of the instructions one by one, with the need to repress the "STEP" key to validate the execution of the following elementary instruction). Comment: Numerous Basic_DM instructions break down into several elementary instructions. Therefore, the "STEP" key often has to be pressed several times before the "Line" information will move.
HOLD	This key temporarily stops program execution. It changes to step by step mode. The operation pointer stops moving. The following instruction will not be carried out until the "START" or "STEP" key is pressed.
STOP	This key stops the execution of the program permanently. Pressing the "START" or "STEP" key will restart the program at the first line of the PROG0 program for the "MAIN" module, at the first line of the PLC program under consideration for "PLC1" and "PLC2" modules.

6.3.2 Inputs / outputs control



The purpose of this tool is to control the forcing of the inputs and outputs of the selected positioner drive. It would normally be used during commissioning to facilitate electrical connection verification.

An all-or-nothing input or output can be forced by:

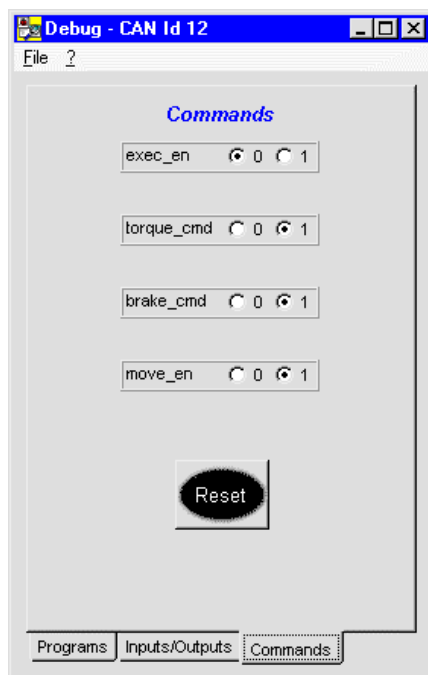
- Selecting ☒ for choice 0 or 1
- Checking ☒ the F cell to validate the forcing

The analog input or output can be forced by:

- Entering the desired value (unit3 or unit4)
- Validating the value acknowledgment using the  button
- Checking ☒ the F cell to validate the forcing

The  button is used to update the display so that the displayed values agree with those actually present in the positioner drive.

6.3.3 Instructions



The purpose of this tool is to facilitate instruction control:

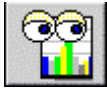
- exec_en (program running authorization)
- torque_cmd (torque authorization)
- brake_cmd (brake management)
- move_en (movement authorization)

The display is updated cyclically in accordance with the values present in the positioner drive.

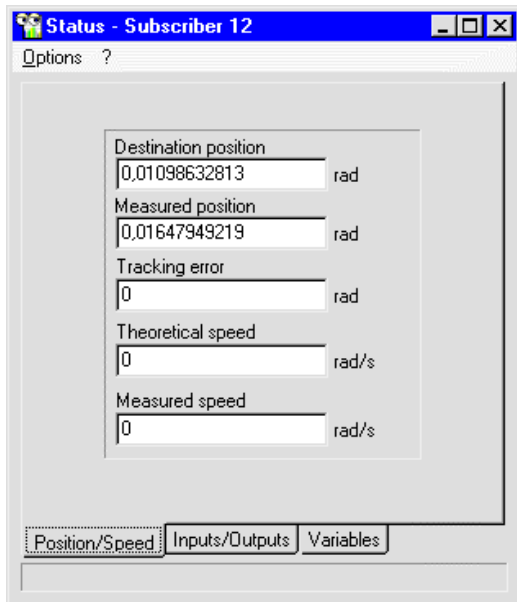
Select ☒ on choice 0 or 1 to change a value.

The  button is used to clear a current fault (fault shown on the 7-segment display on the front panel of the positioner drive): reset_cmd = 1 instruction.

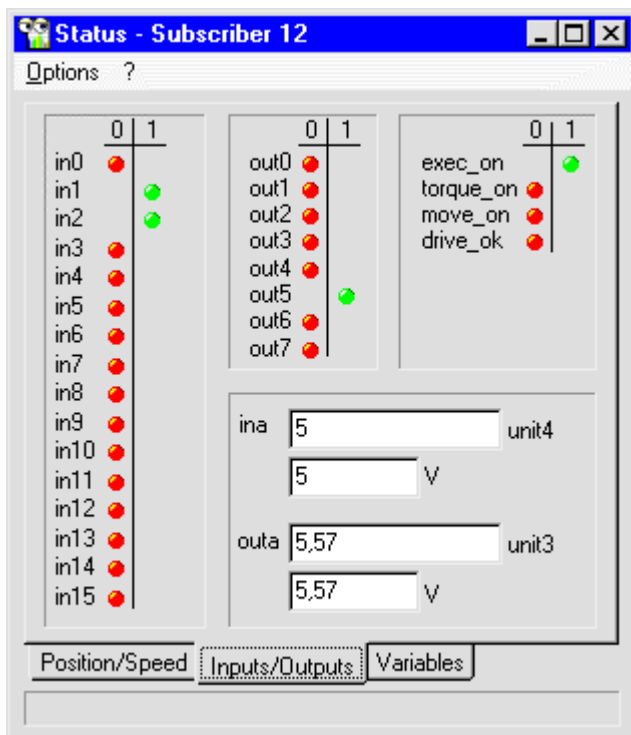
6.4 Variable Watcher



Click on *Variable Watcher* in the *Network Management* environment to open the following window:



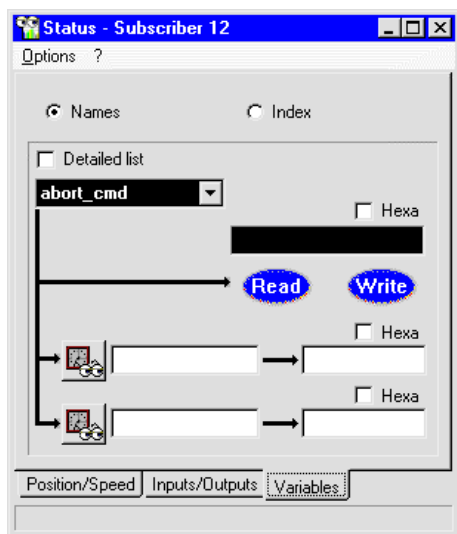
- This tool is used to observe the values taken for the various variables are available to the user.
-
-
-
- The values for the following variables are refreshed in real-time:
-
-
-
- Destination position (*posa*)
- Measured position (*pos1*)
- Tracking error (*tracking_error*)
- Theoretical speed (*speed_th*)
- Measured speed (*speed1*)



- Logic inputs (*in0* to *in15*)
- Logic outputs (*out0* to *out7*)
- Analog input (*ina*)
- Analog output (*outa*)
- Program running data (*exec_on*)
- Validated torque data (*torque_on*)
- Movement authorization data (*move_on*)
- Power on data (*drive_ok*)

A third tab allows the user to observe a desired variable in a list:

- either using a name
- or using a CANopen or PROFIBUS index

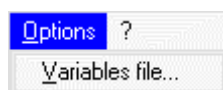


The user can observe other variables by first selecting the desired variable in the drop-down list ▼ and then clicking on *READ* (its value is then explicitly displayed in the window).

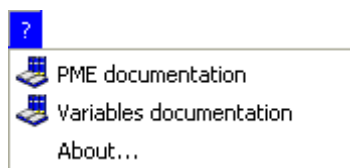
The "detailed list" check ✓ box is used to display all observable variables. When this cell is not checked, only the most frequently used variables will be displayed in the drop-down list.

The "Hexa" check ✓ box is used to display the data in hexadecimal format.

- IMPORTANT! The value of the selected variable is not refreshed in real-time (press *READ* to update the display).
- If the user wants the desired variable to be observed cyclically, click on one of the two buttons  situated under the drop-down list (It is possible to deactivate cyclical observation by clicking on the arrow which is then crossed through with a red cross).
- To modify a variable, enter the value and press *WRITE*. Important, this operation must only be carried out by authorized personnel having full knowledge of the system.

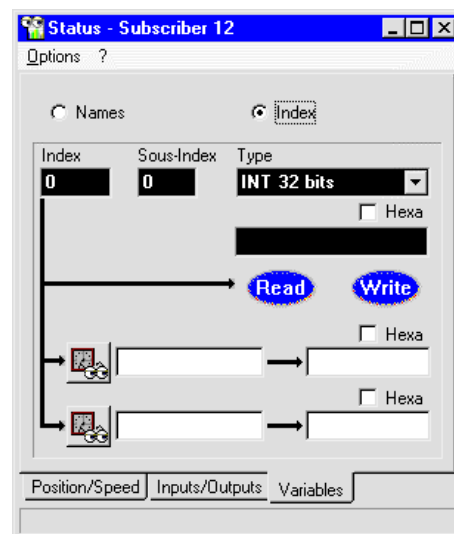


It is possible, when using a name to select a variable, to enrich the selection list by adding variable names contained in a .vdm file (user variable name file). The "detailed list" check ✓ box must be checked for this function to be active.



This menu gives access to the:

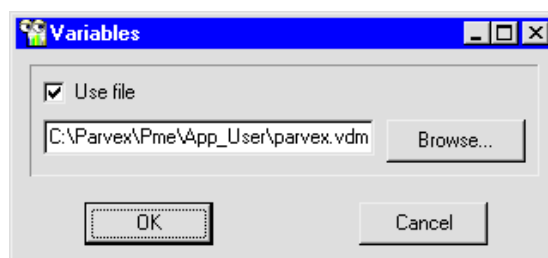
- PME documentation and the directory of system variables (guides in Acrobat Reader PDF format)
- About...window and displays the version number of the current software.



The user can observe other variables by first indicating their index and subindex numbers, and then clicking on *READ*. This window is, therefore, reserved for experienced users.

The index and subindex numbers of the variables which can be displayed are available in the PVD3527 "Directory of variables".

For a value to be written in hexadecimal format, it must be preceded by the \$ symbol (12 decimal → \$0C hexa)

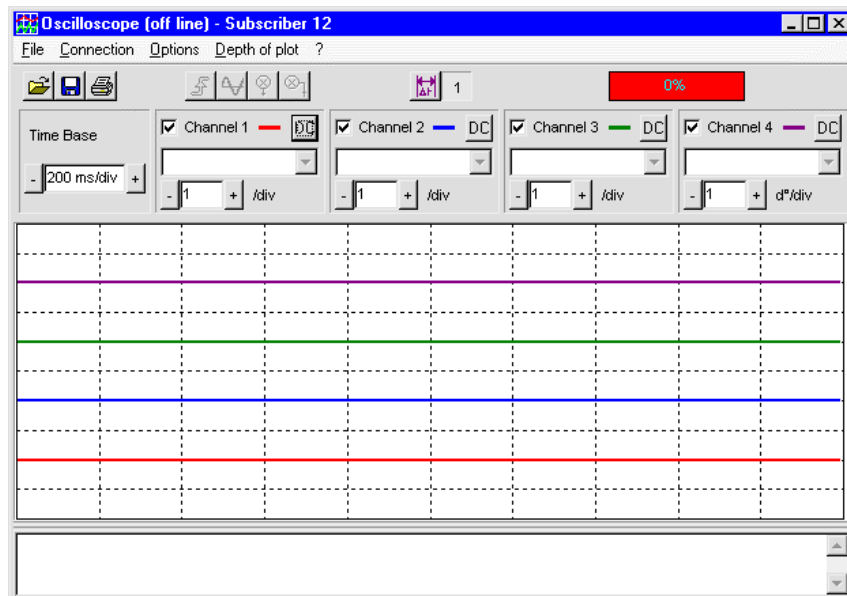


6.5 Oscilloscope Function



This tool is accessible through the *Network Management* environment.

Select the positioner drive related to the observed axis, then click on the button showing an oscilloscope. The following window is then displayed on the screen:



← instruction zone

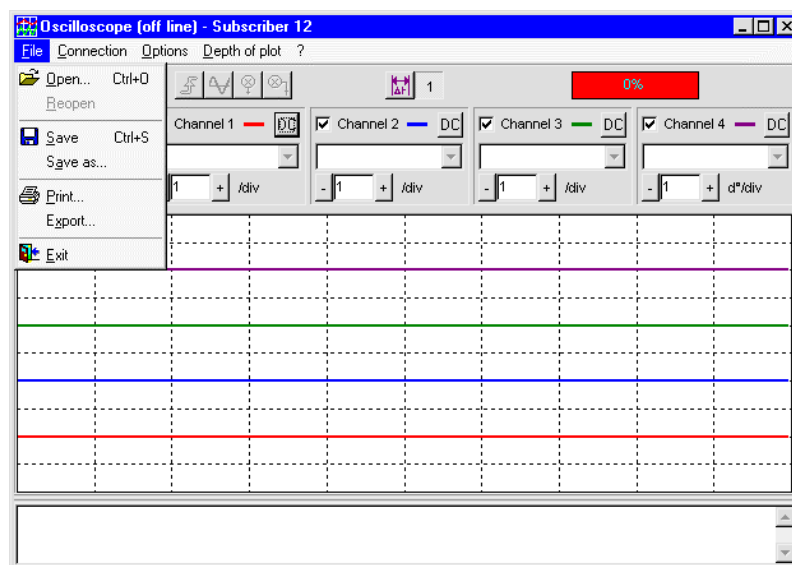
← visualization zone

← comment zone

The title bar shows the status [OFF LINE / ON LINE] of the connection between the positioner drive, the PC and the subscriber number of the axis on the CAN or PROFIBUS bus.

6.5.1 File

This control opens the following window:



File <i>Open</i> 	This control sequence is used to display an oscilloscope graph that was previously saved on a diskette or the hard drive. The <i>Open</i> menu is only available in <i>OFF LINE</i> mode.
File <i>Re-open</i>	This instruction displays a data entry window listing the most recently opened files. The user displays the file of his choice on the screen by clicking on the filename. The <i>Re-open</i> menu is only available in <i>OFF LINE</i> mode.
File <i>Save</i> 	This control sequence saves an oscilloscope graph on a diskette or the hard drive. The file relating to this copy will be saved with an .scp extension.
File <i>Save As</i>	This sequence is the same as the previous one, but is used to specify the following information: - the recording medium (floppy disk or hard drive), - the archives directory, - the .scp filename. The .scp extension is proposed by default. Only files with an .scp extension will be recognized by the <i>Open</i> control sequence or <i>Open again</i> control sequence.
File <i>Print</i> 	Used to print the oscilloscope graph currently displayed on the screen. The default printer is defined in the Windows® environment. (Refer to Control Panel.) Curves, values and comments associated to the graph are printed in "landscape" format.
File <i>Export</i>	This control sequence is used to generate a .csv format file which can be used with an <i>EXCEL</i> ® -type spreadsheet software program.
File <i>Exit</i>	This sequence is used to exit the <i>Oscilloscope</i> environment. Clicking on  , located in the upper, right-hand corner of the <i>Oscilloscope</i> window has the same result Comment: If the window does not close, make sure that the acquisitions are previously stopped by pressing the following button: 

6.5.2 Connection/Disconnection

Connection

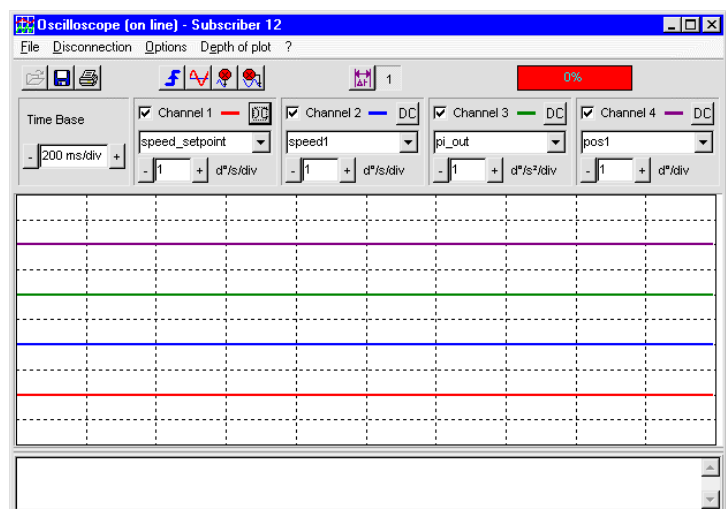
Connection

This control sequence establishes the connection between the PC and the positioner drive.

The *bargraph* displays the progression of the *connection*.

The *Oscilloscope* tool is then used to acquire and observe the variables in real-time.

The *ON LINE* status is displayed in the title bar.



The *Trigger*  and *Acquisition*  buttons are available in connected mode.

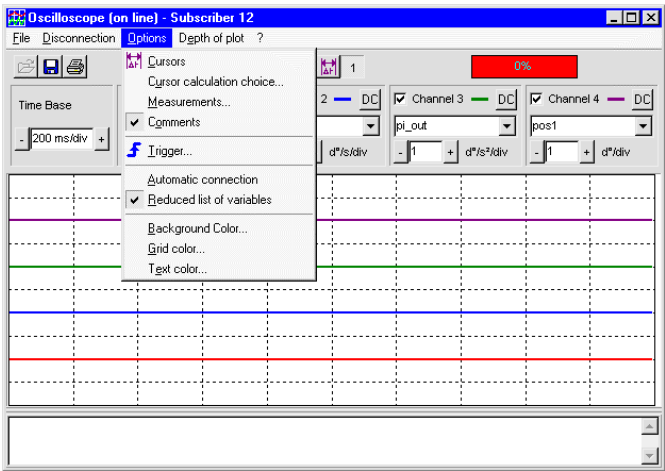
The *Open* button is no longer available. It will become available when the PC is disconnected from the positioner drive through the *Disconnection* control sequence.

Disconnection

The *Disconnection* control sequence is used to disconnect the link between the PC and the positioner drive.

6.5.3 Options

This control sequence opens the following window:



6.5.3.1 Options/Cursors

Options	This sequence is used to activate and deactivate <i>cursors</i> .
Cursors	The <i>Cursors</i> button is highlighted when cursors are active.
	Cursors can be applied to each one of the acquisition channels and are controlled by the mouse or any other type of pointing device. Click on the box to the right of the <i>Cursors</i> button to select the current channel for the cursors. Channel numbers 1, 2, 3 and 4 are successively displayed in drop-down list format.

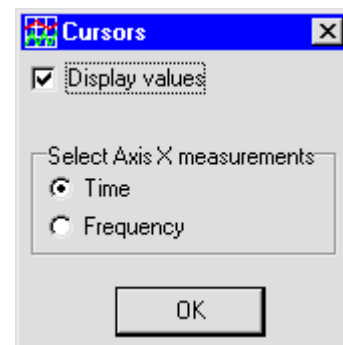
6.5.3.2 Options/Cursor Calculation Choice

Options

Cursor Calculation Choice

This control sequence opens the following window:

Click on **OK** to validate your choice.



<i>Display Values</i>	Check ✓ this cell to display the values associated to the cursors in the upper, right-hand corner of the oscilloscope graph. - The first cursor gives the amplitude of point no. 1 and acts as a measurement reference for the second cursor. - The second cursor supplies the amplitude of point no. 2 and the deviation (difference in time and amplitude) in relation to the first cursor.
<i>Select Axis X Measurements</i>	Time: Select ⊙ this button to display the time delay between the two cursors. Frequency: Select ⊙ this button to convert the time delay into a frequency.

6.5.3.3 Options/Measurements

Options

Measurements

This sequence is used to validate the calculation options carried out on the various plots of the oscilloscope graph.

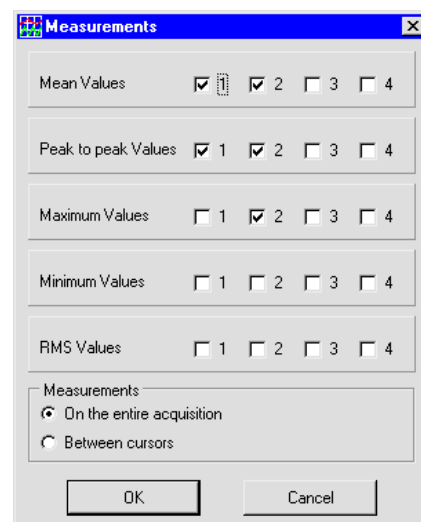
Check ✓ the cells of your choice to select the following:

Average values, peak-to-peak values, maximum values, minimum values, RMS values.

Calculations are carried out:

- either on the entire acquisition
- or on the distance between two cursors

Click on **OK** to validate your choice.



The results of the calculations are displayed, for the selected channel, in an independent window of your choice.

TIP: By clicking successively on the text *Mean values, Peak to peak values, Maximum values, Minimum values or RMS values*, it is possible to ✓ check or deselect cells 1 to 4 of the corresponding line quickly.

6.5.3.4 Options/Comments

Check ☒ this option to authorize the display of the comment zone.

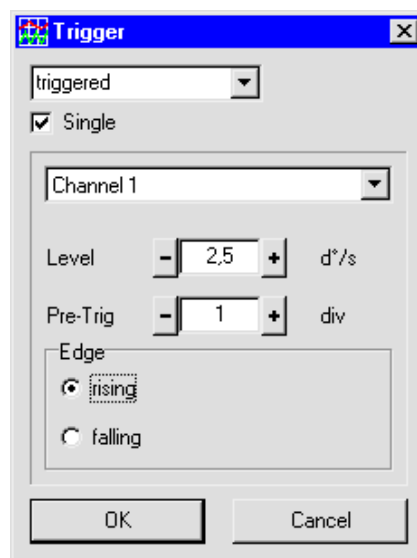
6.5.3.5 Options/Trigger

Options

Trigger



This control sequence opens the following window:



Select the trigger mode from the list by clicking on ▼ :

<i>Immediate</i>	Acquisitions are triggered immediately.
<i>Triggered</i>	Acquisitions are triggered in "triggered" mode on a specified channel.

<i>Single</i>	Check ☒ this cell to obtain one single acquisition. When this cell is not checked, acquisition sequences are routinely renewed.
<i>Level</i>	From this list, click on ▼, to select the channel that will be used as a reference for triggering acquisitions in "triggered" mode.
<i>Threshold</i>	Enter the triggering threshold for carrying out the acquisition in "triggered" mode.
<i>Pre - Trig</i>	Used to display curves, over a pre-determined period of time, before triggering acquisitions using the "trigger". The <i>Pre-Trig</i> value is expressed in <i>divisions</i> . (One <i>division</i> corresponds to a unit of time selected in the <i>Time Base</i>).
<i>Edge</i>	Enter the desired type of edge for the trigger.
<i>Rising</i>	Select ☒ this button for triggering acquisitions on a rising edge.
<i>Falling</i>	Select ☐ this button for triggering acquisitions on a falling edge.

Click *OK* to validate the information selected in the *Trigger* window and to start the acquisition.
Click *Abort* to restore the previous values of the *Trigger* window.

6.5.3.6 Options/Automatic connection

Check ☒ this option to request that the PC be connected automatically to the drive, when the oscilloscope tool opens.

6.5.3.7 Options/List of reduced variables

Check ☒ this option to display only the most frequently used variables in the drop-down list of variables that can be observed using the oscilloscope.

Deselect this option to display all the variables that can be seen with the oscilloscope.

6.5.3.8 Options/Background colour/Grid colour/Text colour

Options

Background colour

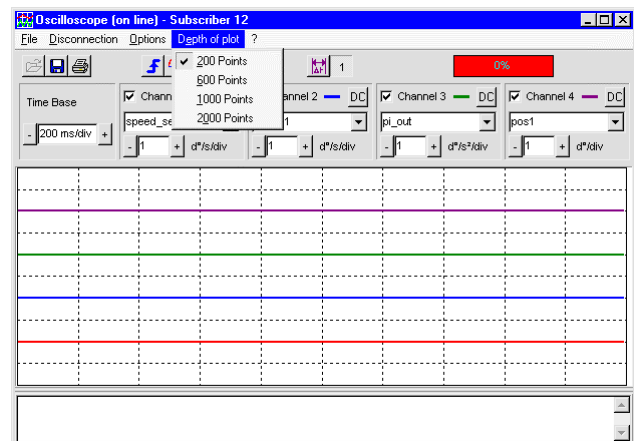
Grid colour

Text colour

This sequence is used to select the background colour of the oscilloscope graph, the colour of the grid and the colour of displayed text.

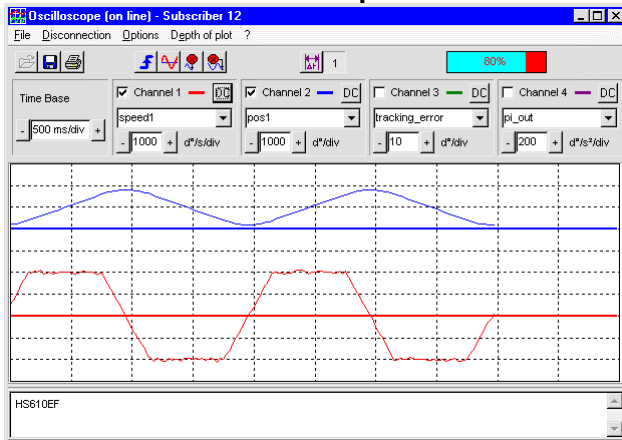
6.5.4 Depth of Plot

This sequence opens the following window:

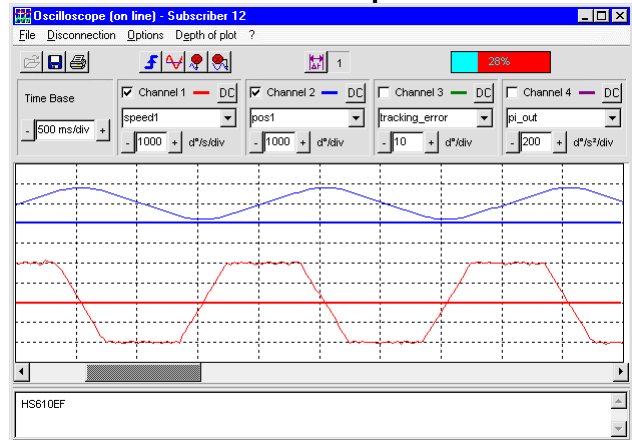


Depth of Plot	☒ 200 points	This choice is selected by default. The acquisition of each curve is sampled using 200 points. All acquired points are displayed on the screen.
Depth of Plot	600 points to 2000 points	Select the desired resolution according to the nature of the recorded variables. A high resolution, for example, is required for observing an isolated perturbation, a high-frequency ripple or for assessing a discontinuity. - Regardless of the resolution selected, a division of the time base always corresponds to 20 check points. - All acquired points are thus divided into consecutive screens of 200 points. - The curve display window can be moved and the various other screens can be displayed by using the translation bar  , located at the bottom of the oscilloscope graph.

Carried out with a 200-point resolution:



Carried out with a 1000-point resolution:

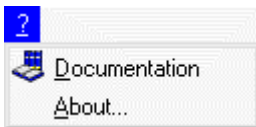


With a *Depth of Plot* of 200 points, the entire acquisition can be displayed on a single screen.

With a *Depth of Plot* of 1000 points:

- Note the presence of a scroll bar at the bottom of the window: its cursor is used to explore the contents of the acquisition.
- On the example above, the 1000 acquisition points are divided into 5 consecutive screens of 200 points each. (The second screen is displayed in the example given above.)

6.5.5 About...



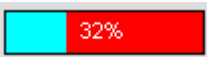
This menu gives access to the:

- PME software guide (Acrobat Reader PDF format)
- About... window and displays the version number of the current software

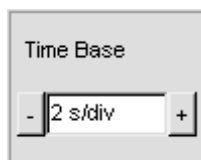
6.5.6 Acquisition

Start acquisition 	Click <i>Acquisition</i> to arm a curve acquisition sequence based on the selected triggering mode. When an acquisition is interrupted, press <i>Acquisition</i> to: - reset a new acquisition sequence, - refresh the screen, - empty the %acquisition bargraph (it becomes 0%).
Stop acquisition immediately 	Click <i>Dead halt acquisition</i> to immediately stop the current acquisition sequence.
Stop acquisition at the end of the sequence 	Click <i>Stop Acquisition</i> to stop the acquisition sequence when the %Acquisition bargraph reaches 100%

6.5.7 %acquisition Bargraph

bargraph 	The bargraph displayed in the upper, right-hand corner of the <i>Oscilloscope</i> window represents the progress of the acquisitions. 0% is displayed and its colour is completely red: - when the curve acquisition is empty, - at the start of the acquisition period. A percentage % is displayed and it is divided into two zones, red and blue: - when an acquisition is in progress (the % value is evolutionary) 100% is displayed and its colour is completely blue: - when the acquisition is finished (<i>One-Time</i> mode validated), - at the end of the acquisition period. Comment: The curves are displayed on the screen in time with the progression of the acquisition.
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6.5.8 Time Base



Enter the desired time base for the acquisition.

Press the  and  keys to facilitate this operation.

6.5.9 Acquisition channels

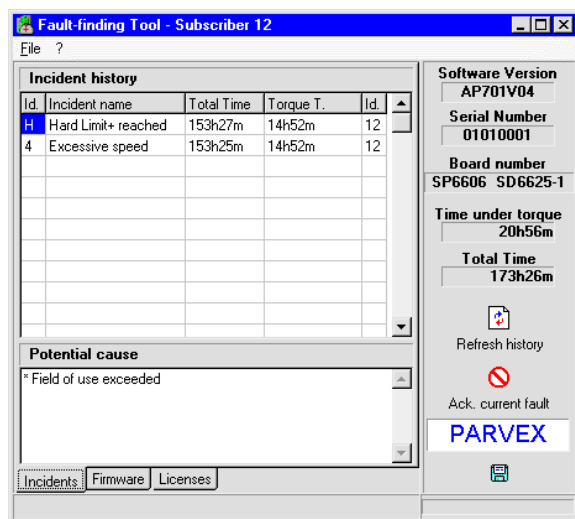
	The <i>Oscilloscope</i> tool has four acquisition channels, respectively called Channel1, Channel2, Channel3 and Channel4. Check ☒ the cell corresponding to the desired acquisition channel to validate its acknowledgement.																																																															
Channel colour	The menu for changing the colour of the curve displayed on the screen can be accessed by clicking on the coloured line to the right of the word <i>Channel</i> .																																																															
DC / AC	Press this button to modify the current coupling. The name on the button indicates the type of coupling selected, AC: for alternating, DC: for direct.																																																															
Assignment ▼	Select the variable to be saved in the drop-down list by pressing ▼. Comment: Only the first few letters of the <i>variable</i> have to be entered in the edition box, so that they are properly indexed in the drop-down list. Examples of physical variables that can be observed: <table><tr><td><i>id_measure</i></td><td>[A]</td><td>Measurement of active component current</td></tr><tr><td><i>ud_voltage</i></td><td>[V]</td><td>Active component voltage control</td></tr><tr><td><i>id_setpoint</i></td><td>[A]</td><td>Reactive component current control</td></tr><tr><td><i>iq_setpoint</i></td><td>[A]</td><td>Active component current control</td></tr><tr><td><i>iu_measure</i></td><td>[A]</td><td>Measurement of current in phase U</td></tr><tr><td><i>iw_measure</i></td><td>[A]</td><td>Measurement of current in phase W</td></tr><tr><td><i>iq_measure</i></td><td>[V]</td><td>Measurement of reactive component current</td></tr><tr><td><i>uq_voltage</i></td><td>[V]</td><td>Reactive component voltage control</td></tr><tr><td><i>bus_voltage</i></td><td>[V]</td><td>Measurement of bus voltage</td></tr><tr><td><i>bus_current</i></td><td>[A]</td><td>Measurement of bus current</td></tr><tr><td><i>filtered_bus_current</i></td><td>[A]</td><td>Measurement of the current filtered in the bus</td></tr><tr><td><i>power</i></td><td>[W]</td><td>Power measurement</td></tr><tr><td><i>thermic_motor_load</i></td><td>[%]</td><td>Thermal load rate of the motor</td></tr><tr><td><i>thermic_drive_load</i></td><td>[%]</td><td>Thermal load rate of the drive</td></tr><tr><td><i>heatsink_temp</i></td><td>[°C]</td><td>Heatsink temperature</td></tr><tr><td><i>Encoder_Sinus</i></td><td>[V]</td><td>Sine Signal SinCos Encoder</td></tr><tr><td><i>Encoder_Cosinus</i></td><td>[V]</td><td>Cosine Signal SinCos Encoder</td></tr></table> Examples of system variables that can be observed: <table><tr><td><i>pos1</i></td><td>[unit1]</td><td>Real position of axis1</td></tr><tr><td><i>speed1</i></td><td>[unit1/s]</td><td>Real speed of axis1</td></tr><tr><td><i>tracking_error</i></td><td>[unit1]</td><td>Value of tracking error</td></tr><tr><td><i>exec_en</i></td><td>[]</td><td>Authorization for program execution</td></tr></table> ...	<i>id_measure</i>	[A]	Measurement of active component current	<i>ud_voltage</i>	[V]	Active component voltage control	<i>id_setpoint</i>	[A]	Reactive component current control	<i>iq_setpoint</i>	[A]	Active component current control	<i>iu_measure</i>	[A]	Measurement of current in phase U	<i>iw_measure</i>	[A]	Measurement of current in phase W	<i>iq_measure</i>	[V]	Measurement of reactive component current	<i>uq_voltage</i>	[V]	Reactive component voltage control	<i>bus_voltage</i>	[V]	Measurement of bus voltage	<i>bus_current</i>	[A]	Measurement of bus current	<i>filtered_bus_current</i>	[A]	Measurement of the current filtered in the bus	<i>power</i>	[W]	Power measurement	<i>thermic_motor_load</i>	[%]	Thermal load rate of the motor	<i>thermic_drive_load</i>	[%]	Thermal load rate of the drive	<i>heatsink_temp</i>	[°C]	Heatsink temperature	<i>Encoder_Sinus</i>	[V]	Sine Signal SinCos Encoder	<i>Encoder_Cosinus</i>	[V]	Cosine Signal SinCos Encoder	<i>pos1</i>	[unit1]	Real position of axis1	<i>speed1</i>	[unit1/s]	Real speed of axis1	<i>tracking_error</i>	[unit1]	Value of tracking error	<i>exec_en</i>	[]	Authorization for program execution
<i>id_measure</i>	[A]	Measurement of active component current																																																														
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<i>uq_voltage</i>	[V]	Reactive component voltage control																																																														
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<i>thermic_drive_load</i>	[%]	Thermal load rate of the drive																																																														
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<i>tracking_error</i>	[unit1]	Value of tracking error																																																														
<i>exec_en</i>	[]	Authorization for program execution																																																														
Range	Enter the desired display range. Press the  and  keys to facilitate this operation. Modification of the <i>Range</i> results in an "expansion" or "contraction" of the display depending on the axis of the ordinates.																																																															

6.6 Diagnostic Assistance Tool

This tool is available in the *Network Management* environment.



6.6.1 Log of Events

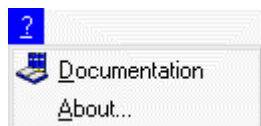


This environment is used to access the following information:

- log of events and their probable causes,
- software version,
- serial number of the positioner drive,
- total operating time and under torque.

N.B. This information is not routinely updated. The given values as well the *Log of Events* correspond to those that exist when the window is opened. To update these values, click *Refresh*.

Incident report	Displays the uncoded designation for the incident that has occurred.
Possible causes	Possible causes associated with an incident are obtained by clicking on the text of the incident.
	Discharges a fault in progress (fault visible on the 7 segment display contained in the front panel of the drive)
	Refreshes the information displayed on the screen.
	Saves a record of the faults and all other information supplied on the screen in a text file (.txt).



This menu gives access to the:

- PME software guide (Acrobat Reader PDF format)
- About... window and displays the version number of the current software

6.6.1.1 List of Listed Events

The listed events and their identification codes on the 7-segment display located on the front panel of the positioner drive are given below. The *status_number* variable is used to obtain the status of the drive.

Description	Display	status _ number	Status
<i>Stand by without power with execution of application program</i>	0	36	Information
<i>Stand by without power without execution of application program</i>	blinking 0	1	Information
<i>Power present with execution of application program</i>	1	21	Information
<i>Power present without execution of application program</i>	blinking 1	2	Information
<i>Resolver failure</i>	2	3	Major Fault
<i>Encoder fault</i>	blinking 2	37	Major Fault
<i>Excessive ambient temperature</i>	3	4	Major Fault
<i>Excessive heatsink temperature</i>	3	5	Major Fault
<i>High heatsink temperature with reduced current</i>	blinking 3	6	Information
<i>Excessive motor speed (in rpm)</i>	4	7	Major Fault
<i>Excessive application speed (in Units/s)</i>	4	35	Major Fault
<i>Excessive supply current</i>	5	8	Major Fault
<i>Excessive drive current</i>	6	9	Major Fault
<i>Excessive dl/dt</i>	6	10	Major Fault
<i>Excessive average current</i>	7	11	Major Fault
<i>Excessive RMS current</i>	7	13	Major Fault
<i>Excessive average current with reduced current</i>	blinking 7	12	Information
<i>Excessive RMS current with reduced current</i>	blinking 7	14	Information
<i>Bus overvoltage</i>	8	15	Major Fault
<i>Excessive motor temperature</i>	9	16	Major Fault
<i>Option card fault</i>	11	29	Major Fault
<i>Incompatible Axis/Spindle definition</i>	A	17	Major Fault
<i>CAN or PROFIBUS link fault</i>	b	18	Major Fault
<i>Synchronization message timeout</i>	blinking b	41	Minor Fault
<i>Motor not connected</i>	C	19	Major Fault
<i>User program memory fault</i>	d	20	Major Fault
<i>Emergency stop</i>	E	38	Major Fault
<i>Personalization board missing</i>	F	22	Major Fault
<i>Axis / personalization board incompatible</i>	F	23	Major Fault
<i>Internal parameter calculation fault</i>	F	24	Major Fault
<i>Licence missing</i>	blinking F	42	Minor Fault
<i>+ Electrical limit reached</i>	H	25	Minor Fault
<i>- Electrical limit reached</i>	H	26	Minor Fault
<i>+ Software limit reached</i>	L	33	Minor Fault
<i>- Software limit reached</i>	L	34	Minor Fault
<i>Program execution fault</i>	P	27	Minor Fault
<i>Tracking error fault</i>	U	28	Major Fault
<i>C167 CPU Fault</i>	.	31	Major Fault
<i>DSP CPU Fault</i>	. blinking	32	Major Fault

Types of faults:

Major	A major fault causes the OK relay switch to open (and, therefore, the power would usually cut out). The axis is no longer servo-controlled and the power bridge closes. The torque_sys system request is forced to 0 (identical request to the torque_cmd = 0 user request) and the target position (<i>posa</i>) instruction to the actual axis position. Therefore, there is no tracking error and the axis will not move suddenly when the power is turned back on. If the brake is controlled by the motion controller (see the <i>Operating modes</i> window, tab <i>Brake</i>), the “brake” relay switch opens and causes the brake to close. Program running is not suspended and the OK relay switch remains open until fault clearance is carried out (<i>reset_cmd</i> = 1).
Minor	A minor fault indicates an operating anomaly which, as a general rule, does not affect movement nor program running. Exceptions: • software or electrical running limit fault reached: these faults cause all movement in progress to stop, just as if the instruction <i>ABORT</i> had been programmed. The axis slows down (<i>accel_prog</i>) then stops. The position obtained at the end of the deceleration remains servo-controlled and the target position (<i>posa</i>) instruction becomes the stopped position. Next, only movement to clear the running limit is possible. These faults clear themselves as soon as the running limit is cleared. Program running is not suspended. • program running fault: program running is suspended.

When a fault occurs, a message identifies the source of the event. When the diagnostic is completed, the user eliminates the problem using the appropriate process.

6.6.1.2 Voltage Monitoring

Bus Overvoltage	A failure occurred during the recovery of braking energy. • for energy return modules on resistance: excessive recovery cycle or braking resistance out of order. • for energy return modules on the network: the network was disconnected during a recovery. Diagnostics: - energy recovery is excessive, - recovery of braking energy is impossible, - disconnection of the network, - internal problem.
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6.6.1.3 Current Monitoring

Excessive Supply Current	This involves the input current for the drive. The fuse used to protect the supply is probably destroyed. Diagnostic: - generally corresponds to an internal drive problem, - damaged power transistors, - malfunction of the <i>gate</i> control of the transistors.
Excessive Drive Current	This involves the output current for the drive, which has exceeded the pulsed current by 30%. The load impedance is not adapted: - check the connection between the motor and the drive (3-phase supply present), - check the adequacy between the motor programmed in the association and the motor. Diagnostic: - short-circuit between motor phases, - short-circuit between a phase and the ground, - inadequacy between the motor and the drive.
Excessive di/dt	Check the status of the connection between the motor and the drive. Switch OFF the power and measure the impedance between the three phases of the motor and the insulation impedance between the phase and the ground. Diagnostic: - short-circuit between motor phases or between a phase and the ground, - use of a long stretch of cable without an output filter, - use of a long stretch of shielded cable with a high per unit length capacity, - in both aforementioned cases, use recommended output filters for the drive.
Excessive Average Current	To prevent the power semi-conductors from overheating, the average current, filtered by a 2.4-second time constant [$I = f(t)$], is monitored. The fault is detected when the average current is equal to, or exceeds, the permanent current that is acceptable by the drive. Depending on the adopted strategy (See <i>Servocontrol Settings</i>, 2nd tab <i>Servocontrols</i>), this fault may: - cause the main switch [<i>POWER OFF</i>] to open, - reduce the current for the drive to 90% of the permanent current acceptable by the drive. This type of fault occurs when the requested acceleration requires a current greater than the permanent current of the drive and for too long a time. Diagnostic: - generally a mechanical friction point, - operating cycle too high, - missing motor phase, - sometimes, incompatibility of the resolver and motor connection.
Excessive RMS Current	To prevent the excessive overheating of the motor windings, the rms current, filtered by a time constant sent by the motor database [$I^2 = f(t)$], is monitored. The fault is detected when the average current is equal to, or exceeds, the permanent current that is acceptable by the motor with a low rpm. Depending on the adopted strategy (See <i>Servocontrol Settings</i>, 2nd tab <i>Servocontrols</i>), this fault may: - cause the main switch [<i>POWER OFF</i>] to open, - reduce the current for the drive to 90% of the permanent current acceptable by the drive. This type of fault occurs when motor when control cycle is too restrictive (high acceleration and deceleration frequency, high resisting torque). Diagnostic: - generally a mechanical friction point, - operating cycle too high, - missing motor phase, - sometimes, incompatibility of the resolver and motor connection.

6.6.1.4 Temperature Monitoring

<i>Excessive Heatsink Temperature</i>	There are no faults for temperatures less than 70°C. If the heatsink temperature is between 70°C and 94°C, the pulsed current of the drive is linearly reduced 2%/°C (i.e. a 50% reduction of the pulsed current at a temperature of 94°C). When the temperature reaches 95°C, the fault triggers a <i>POWER OFF</i> sequence. Check cabinet ventilation and ensure fans are working.
<i>Excessive Motor Temperature</i>	The motor is equipped with a temperature probe incorporated with the windings. An excessive temperature triggers a fault detection. Diagnostic: - Problem with the motor - Incorrect motor parameters
<i>Excessive Ambient Temperature</i>	A temperature probe located between the electronic boards detects excessive ambient temperatures and triggers a <i>POWER OFF</i> sequence. Check cabinet ventilation and ensure fans are working.

6.6.1.5 Monitoring of Limit Stops

<i>+ Hardware Limit Reached</i>	The <i>+ Hardware limit</i> is reached and the movement cannot continue in the <i>+</i> direction. Disengage the axis by moving it in the opposite direction using the <i>stimuli generator</i> , the <i>manual operation</i> tool, or a user program.
<i>- Hardware Limit Reached</i>	The <i>- Hardware limit</i> is reached and the movement cannot continue in the <i>-</i> direction. Disengage the axis by moving it in the opposite direction using the <i>stimuli generator</i> , the <i>manual operation</i> tool, or a user program.
<i>+ Software Limit Reached</i>	The <i>+ software limit</i> is reached and the movement cannot continue in the <i>+</i> direction. Disengage the axis by moving it in the opposite direction using the <i>stimuli generator</i> , the <i>manual operation</i> tool, or a user program.
<i>- Software Limit Reached</i>	The <i>- software limit</i> is reached and the movement cannot continue in the <i>-</i> direction. Disengage the axis by moving it in the opposite direction using the <i>stimuli generator</i> , the <i>manual operation</i> tool, or a user program.

6.6.1.6 Connection Monitoring

<i>Resolver Malfunction</i>	The resolver is missing or its wiring is defective. Diagnostic: - resolver excitation malfunction, - one or more wires of the resolver is (are) broken, - certain wires were inverted during wiring, - poor contacts (check connections).
<i>Encoder Malfunction</i>	The encoder is missing or its wiring is defective. Diagnostic: - Encoder de-energized - encoder malfunction, - one or more wires of the encoder is (are) broken, - certain wires were inverted during wiring, - poor contacts (check connections).
<i>Option Card Fault</i>	An option was validated and the related card is not found in the drive. Diagnostic: - problem with the option card, - poor parameter definition.
<i>Motor not connected</i>	[Monitoring level available at a later date] A missing connection between the motor and the drive was detected. Check the power connections at the level of the drive and the terminal box of the motor.
<i>Missing Personalization Card</i>	The personalization card is missing. The memory storing the machine parameters (EEPROM) and the application programs (FLASH) is not occupied, therefore the system is inoperative. Diagnostic: - Check to see if the personalization card is not unplugged.

6.6.1.7 Monitoring of movements in progress

<i>Excessive Motor Speed (in rpm)</i>	The speed of the motor has exceeded its maximum value, assigned in the database, by 15%. This fault indicates that a technological limit was exceeded. Check resolver connection.
<i>Excessive Application Speed (in Units/s)</i>	The speed of the motor has exceeded the <i>speed_max</i> value. [Refer to <i>Operating Modes</i> , <i>Configuration</i> tab, <i>Max. Application Speed</i> entry.] This fault implies an over-speed inherent to the application program.
<i>Tracking Error Fault</i>	The tracking error has exceeded the authorized <i>trackerror_max</i> value. This fault can be generated by a problem of a mechanical nature (friction point, abnormal restriction) or when the <i>trackerror_max</i> value is not adapted to the performances of the position servocontrol. Diagnostic: - poor parameter settings, - mechanical problem.
<i>Emergency Stop</i>	An emergency stop was requested. [Corresponding system variable: <i>emergency_stop</i> = 1]

6.6.1.8 Monitoring of the operational system of the positioner drive

<i>CPU Fault</i>	The CPU detected a fault, but restarted.
<i>Communication link fault</i>	An incident has occurred during exchanges between the drive positioner and the PC or with the other subscribers on the CANopen or PROFIBUS communication bus. Diagnosis: - wire disconnected - unit turned off
<i>Internal Parameter Calculation Fault</i>	The set of parameters supplied by the user resulted in an inconsistent calculation or one that cannot be used by the positioner drive.

6.6.1.9 Monitoring of the functional system of the positioner drive

<i>Incompatibility of Axis /Spindle Definition</i>	Incompatibility of definition between the Axis-Spindle software bit and the copper strip J0.
<i>Incompatibility of Axis /Personalization Card</i>	Incompatibility between the axis type or range memorized in the personalization card and the real axis type or range.
<i>Program Execution Fault</i>	A programming error was detected. Additional data concerning the nature of the error is displayed.
<i>User Program Memory Fault</i>	Not currently available.
<i>Synchronization message timeout</i>	A problem has occurred during synchronization message transmission ("Position drive with interpolation" mode).
<i>Licence missing</i>	An operating mode used requires authorization by entering a licence code (see section "6.6.3 – Licences").

6.6.1.10 Indicated operating malfunctions

High heatsink temperature with reduced current

Excessive average current with reduced current

Excessive RMS current with reduced current

These events are not considered as faults. They are just indications of operating malfunctions.

6.6.1.11 Indicated Statuses

"Stand by" without power and without execution of application program

Power present without execution of application program

Power present with execution of application program

"Stand by" without power with execution of application program

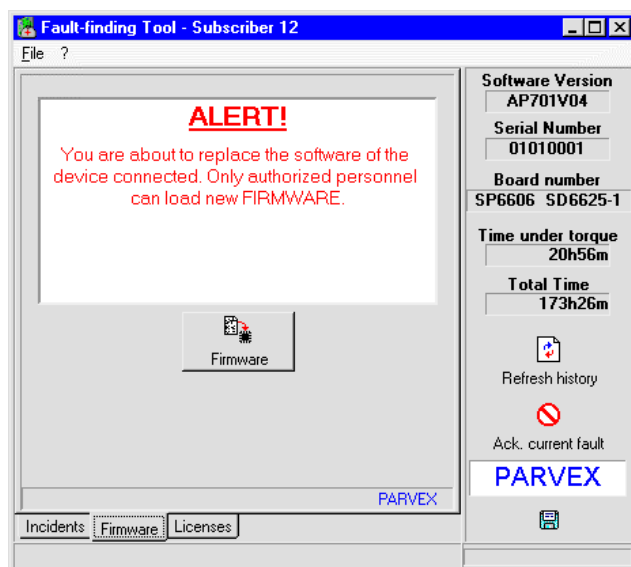
Situation corresponding to *POWER OFF*.
[Corresponding Parameter: *drive_ok* = 0]

Situation corresponding to *POWER ON*.
[Corresponding Parameter: *drive_ok* = 1]

Execution of normal situation in progress
[Corresponding Parameter: *drive_ok* = 1]

Execution of normal situation in progress
[Corresponding Parameter: *drive_ok* = 0]

6.6.2 Loading Firmware



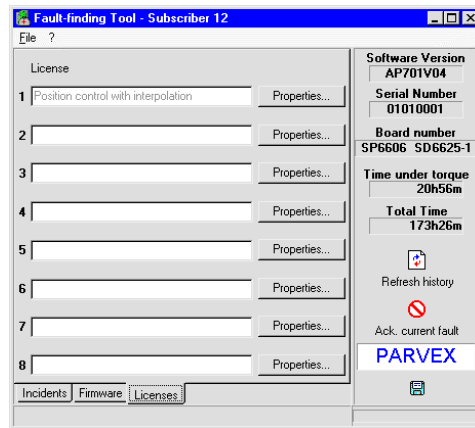
This window is for loading new *Firmware* (operating system software) into the FIRM_DM memory. This function saves the user from having to change the memory hardware (located on the motherboard of the positioner drive) when updating the software version of his system.

Click on the button below to delete and load software via the communication bus:



⇒ This operation must be carried out only if there is a valid reason! (Contact PARVEX first).

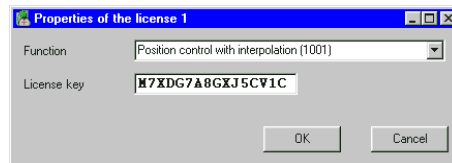
6.6.3 Licences



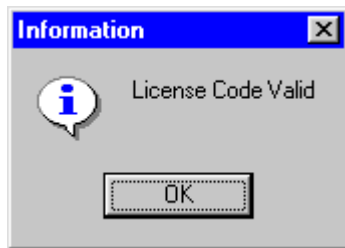
This window allows to enter and to show the software licenses associated to the product.

6.6.3.1 New license validation

Choose an empty line and click the **Properties...** touch which is associated to it. A window appears. Select the function to be authorized thanks to the pop-up menu. Enter the corresponding code of validation then rest on OK.



To validate a new license, select a new line and enter the given code. Validate with ENTER.



The following window is posted if the code is valid.

Remark: The licence code is memorized automatically. No specific operation is necessary for it to be saved in EEPROM memory.



This window is displayed if the code is not recognized.

Check that you have entered upper and lower case letters correctly.

The required code is based on the serial number of the appliance for which it was produced. Therefore, a code that is valid for one appliance will not be valid for another.

6.6.3.2 Deletion of a licence

Click the touch **Properties...** of the license to be abolished. Leave space the field of seizure corresponding to the code of validation then rest on OK.

7. PROGRAM EDITOR

7.1 Presentation

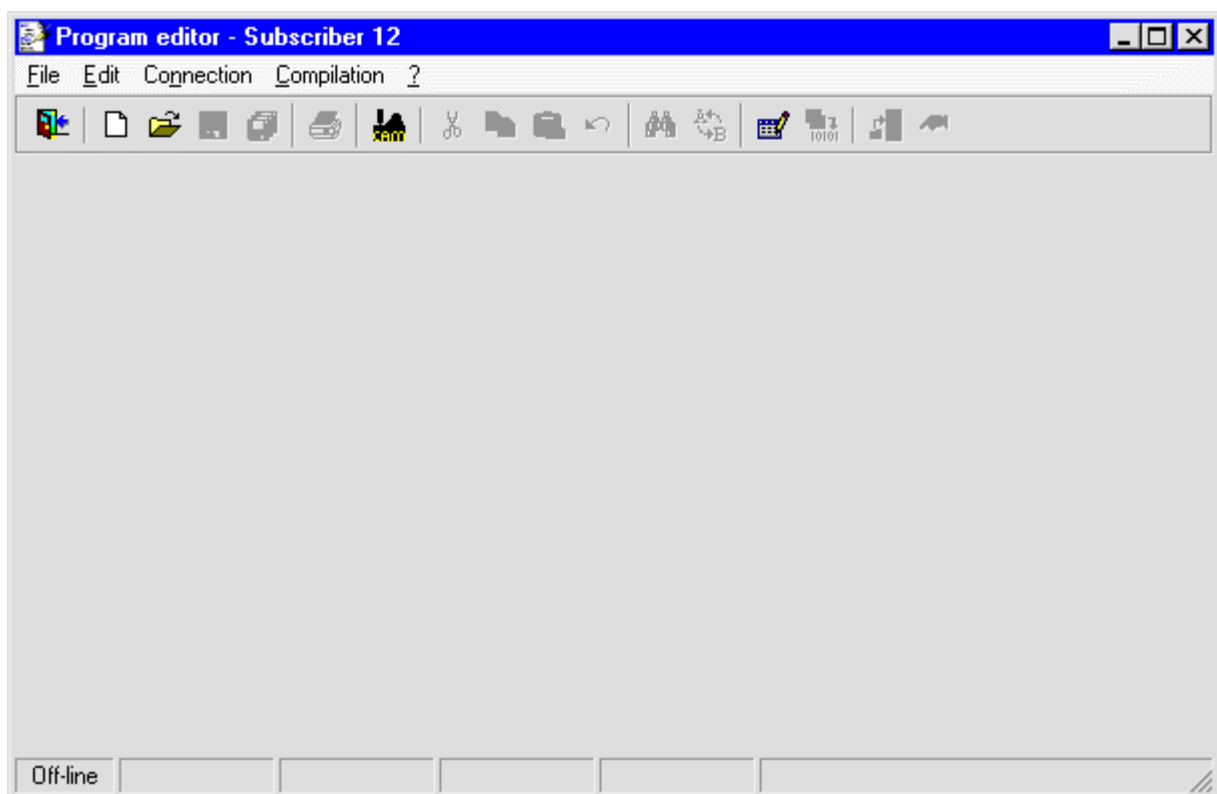
The *Program editor* tool implements user programs written in Basic_DM language.

Please refer to the DIGIVEX Motion "PVD 3517 - Programming Manual" for instructions on how to use this language and the training manual.

The *Program Editor* tool is accessed through the *Network Management* environment, and then clicking the following button:



The following window is displayed on the screen:

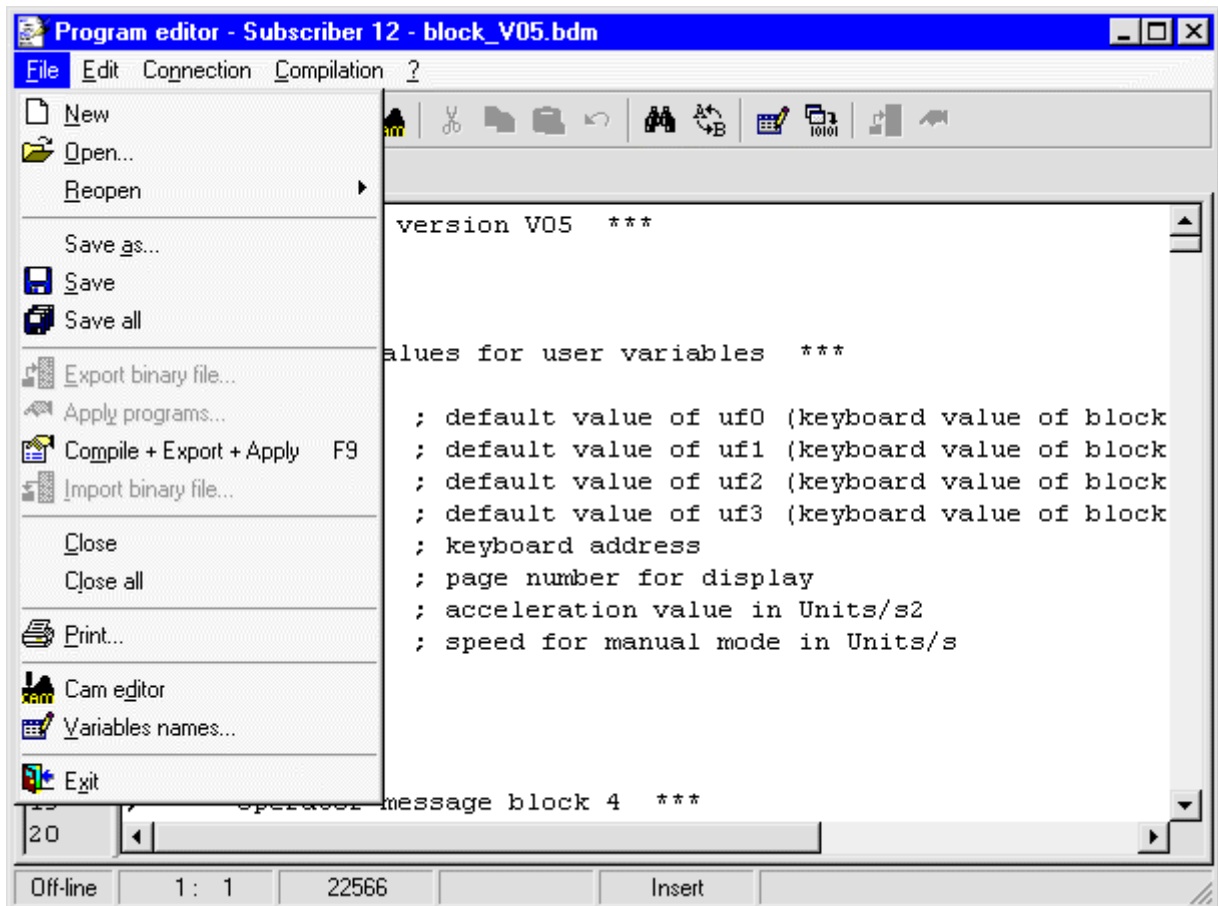


The  button gives access to the cam editor. Please refer to the PVD3538 "DIGIVEX Motion – Additional Cam Information" Manual for further information.

This operating mode requires the use of a licence during DIGIVEX Motion cam execution (see section "6.6.3 – Licences").

7.2 Program Editor Functions

7.2.1 File



File	<i>New</i> 	This command opens a new edition session. No filename is displayed in the upper strip of the data entry window. The active tab is named <i>Page1</i>. The edition page is blank; the user may start his edition. At this point, text can be entered using <i>Basic_DM</i> language. At the end of the edition, save the current session using the <i>File / Save As</i> or <i>File Save</i> commands (see below).
File	<i>Open</i> 	This function opens a dialog window where the user selects the medium, directory and filename that will be displayed on the screen. The active tab will display the name of the open file (<i>motion_block.bdm</i>, for example). N.B. Only files having a recognized extension will be listed in <i>File / Open</i> command sequence.
File	<i>Re-Open</i>	This command displays a data entry window listing the most recently opened files. The user displays the file of his choice on the screen by clicking on the filename.

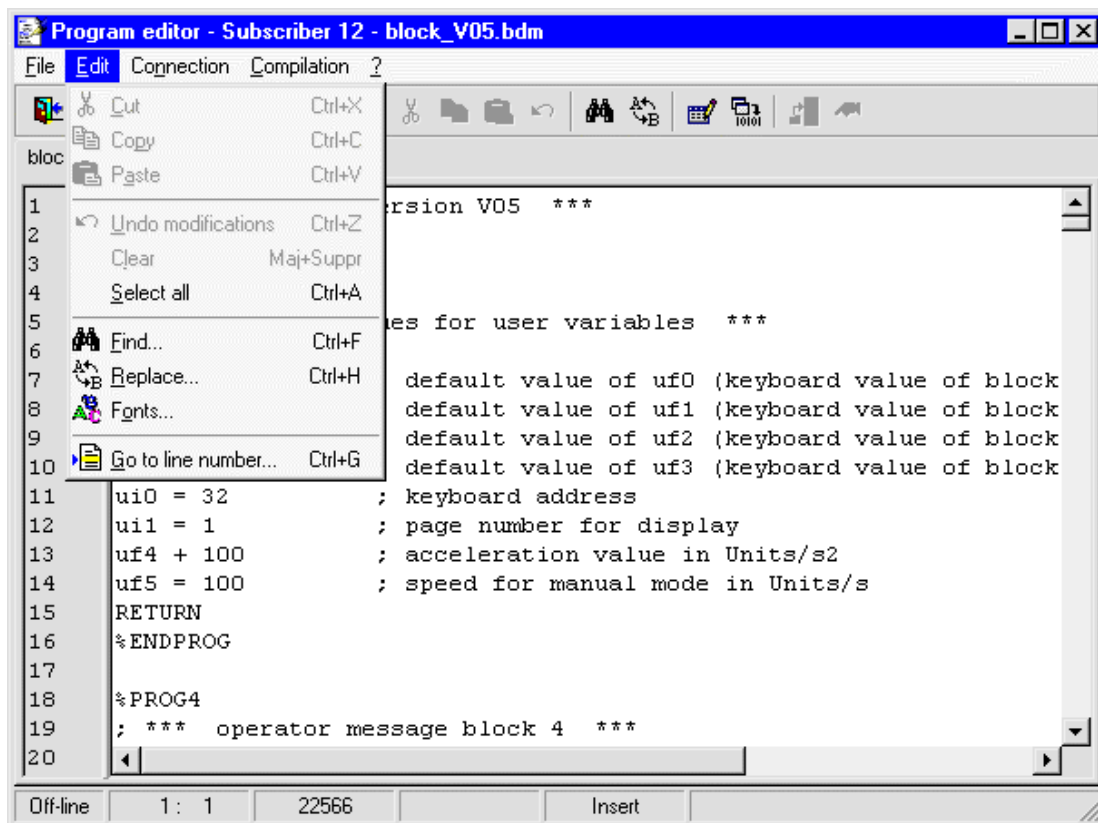
File Save As 	This sequence is used to save the session displayed on the screen and to specify the following information: - recording medium (floppy disk, hard drive, etc...), - archives directory, - filename, - its extension. The .bdm extension is used for files written in <i>basic</i> . The .bdm extension is associated with a file using <i>basic_DM</i> language.
File Save 	This sequence saves the current edition session. This session corresponds to the active tab.
File Save All 	This command sequence saves all open edition sessions (represented by all active tabs).

The following four commands are accessible when the PC is connected to the positioner drive; use the *File Connection* command to achieve this (see description below).

File Export binary file 	This command exports to <i>FLASH_DM</i> memory: - the <i>object.odm</i> file (a binary file executable by the positioner drive, result of the compilation of the <i>source.bdm</i> file), - the <i>source.bdm</i> file (a source file written in <i>Basic_DM</i> language), if the compilation option "Include the source files" has been validated, - the file that defines the variable names, if there is one (<i>.vdm</i> file).
File Apply programs 	This command sequence exports the binary program executable by <i>FLASH_DM</i> memory to <i>PROG_DM</i> memory, at the end of execution. N.B. User programs executed by the positioner drive are those found in <i>PROG_DM</i> memory.
File Compile + Export + Apply 	This sequence combines in one single operation the following three commands: <i>Compile</i> <i>Export binary file</i> <i>Apply programs</i>
File Import binary file 	This command sequence undertakes the function inverse to <i>File Export binary file</i> : - the <i>object.odm</i> file present in <i>FLASH_DM</i> memory arrives in the computer RAM, <i>RAM_PC</i>, together with the file that defines the variable names (<i>.vdm</i> file), if there was one, - the associated <i>source.bdm</i> file is opened and displayed on the screen.
File Close 	This command closes the current edition session. The active tab disappears.
File Close All 	This command sequence closes all edition sessions in progress. All tabs (active and inactive) disappear from the <i>Program Editor</i> environment.
File Print 	Click on the <i>Print</i> button (or the <i>File / Print</i> command sequence) to print the text relating to the edition session being processed. The default printer is defined in the Windows® environment. (Refer to Control Panel.)
File Cam editor 	This function gives access to the cam editor. For further information, please refer to the PVD3538 "DIGIVEX Motion - Cam function" Manual.
File Variable names 	This function gives access to the variable name editor. See section 7.2.5 of this manual.

File <i>Exit</i> 	Click on the <i>Exit</i> button (or the <i>File</i> Exit control sequence) to end the <i>Program Editor</i> session. If modifications were made during this session, the user will be asked if he wishes to save these modifications in a file before exiting this environment (<i>Save</i> function). Afterwards, the window closes.
--	---

7.2.2 Edit



The following five control sequences are available after one or more elements of text currently being edited have been selected, using a mouse or any other pointing device.

Edit <i>Cut</i> 	This function deletes items selected, with the use of the mouse, from text currently being edited. The <i>Program Editor</i> stores the cut items in a "Clipboard" type memory. These items may be re-used with the <i>Edit / Paste</i> function.
Edit <i>Copy</i> 	This control sequence places the text items selected with the mouse into the "Clipboard" type memory. These items can then be re-used using the <i>Edit / Paste</i> function.
Edit <i>Paste</i> 	This function pastes the text items, which are stored in the "Clipboard" type memory, in the place indicated by the pointing device (mouse).

Edit <i>Undo modifications</i> 	This command sequence cancels the last keystroke.
Edit <i>Clear</i>	The role of this function is to <i>clear</i> (delete) the text item(s) selected by the mouse.

Other commands available for making word processing easier:

Edit <i>Select All</i>	This function selects all the text currently being edited. It is used for word processing (copy, paste, change fonts, etc...)
Edit <i>Find</i> 	This control sequence opens a dialog box. The user fills in the " <i>Find</i> " data entry field. Click <i>Continue</i> to proceed with the search. Click <i>Cancel</i> to close the dialog box. The following <i>Find</i> options are also available: ✓ Whole string, ✓ Case-sensitive.
Edit <i>Replace</i> 	This function opens a dialog box. The user fills in the " <i>Find</i> " and " <i>Replace with</i> " data entry fields. Click <i>Replace</i> to replace the specified term. Click <i>Replace All</i> to replace the specified term throughout the entire text being edited. Click <i>Continue</i> to continue with the Replace sequence. Click <i>Cancel</i> to close the dialog box. The following <i>Replace</i> options are also available: ✓ Whole string, ✓ Case-sensitive.
Edition <i>Fonts</i> 	This command sequence opens a dialogue window that gives the user a choice of font, style and character size.
Edit <i>Home</i> 	This function is used to place the edit cursor at the beginning of the specified line.

7.2.3 Connection / Disconnection

Click *Connection* to display *Disconnection* in the strip of available commands.

The *Connection* command is available when the status is *OFF LINE* (drive not connected), while the *Disconnection* command is available when the status is *ON LINE* (drive connected).

<i>Connection</i>	This command sends the connection request from the PC to the drive. When the connection is completed, the status is switched to <i>ON LINE</i> . N.B. The status must be in <i>ON LINE</i> mode in order to be able to <i>Export</i> or <i>Import</i> an <i>item.odm</i> file.
<i>Disconnection</i>	This command sends the disconnection request from the PC to the drive. When the disconnection is completed, the status is switched to <i>OFF LINE</i> .

7.2.4 Compilation

The following button is associated with this function:



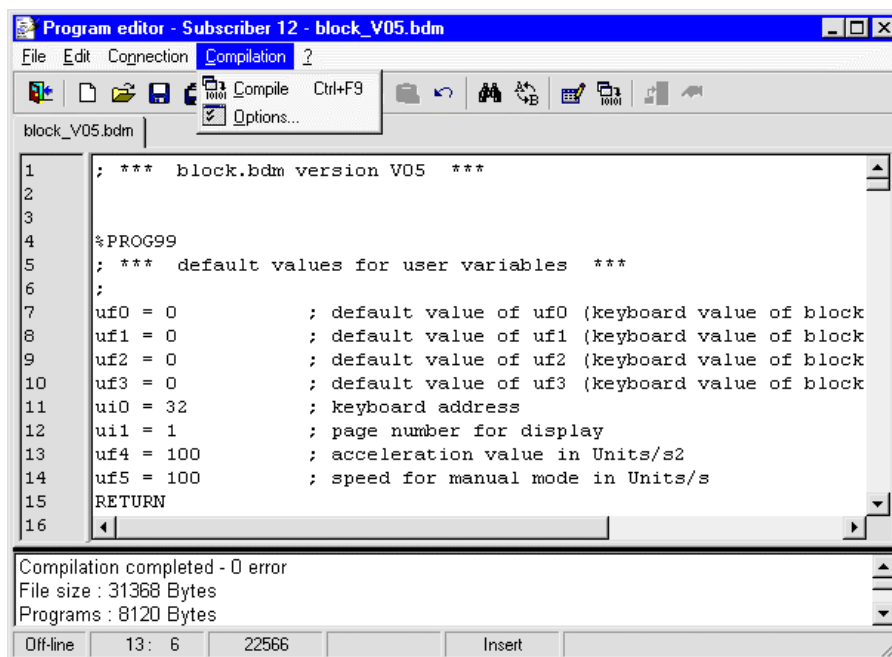
Compilation is a software operation that consists of translating a *source* program, written in a given language (*Basic_DM*, *assembler*,...) into a binary language that is "understood" by the operating system of the positioner drive (*firmware*).

This is the role of the compiler function. It generates a *compiled* file that has a *binary file* name and an **.odm** extension.

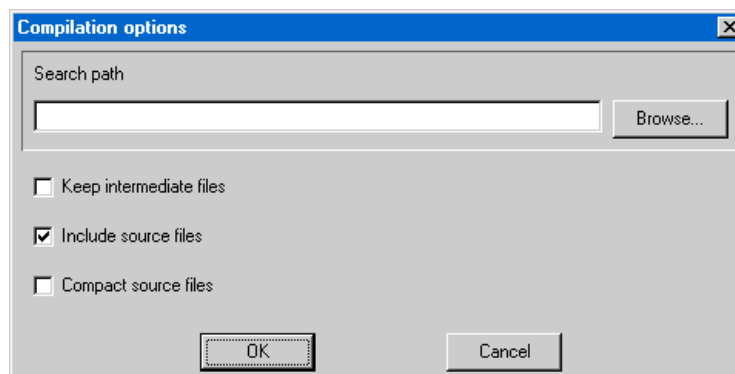
It is important that the compilation result has no errors, or warnings of any type. An *Export binary file* sequence for testing the user program can only be attempted if this condition is met.

Comment : Directions for use and the instructions for the *Basic_DM* language function are described in the Programming Manual, reference PVD 3517 GB.

Example of display when no errors are detected during compilation:

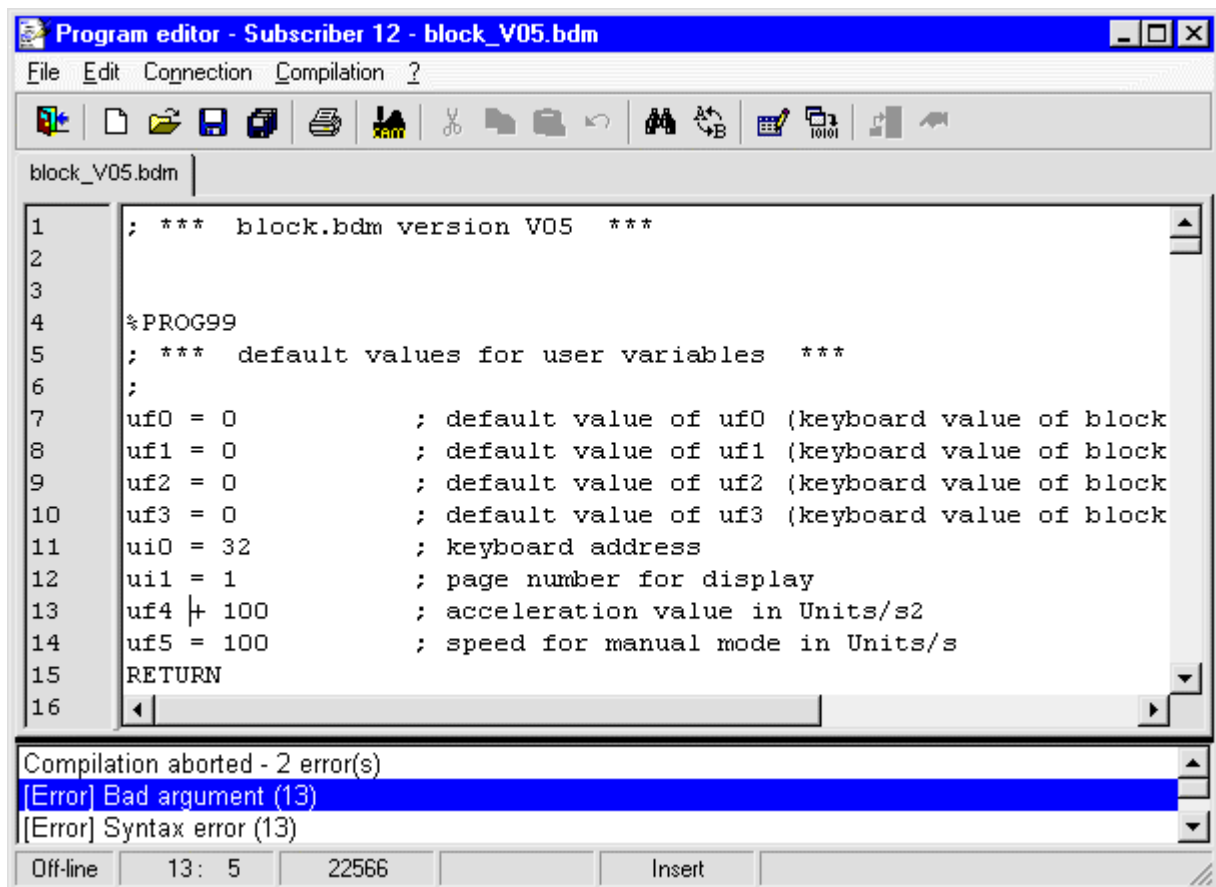


Compilation options is accessed via the  Options menu:



<i>Keep intermediate files</i>	This option allows the user to keep system files that have been generated during compilation. This option is of little interest for ordinary usage.
<i>Include source files</i>	This option, selected by default, authorizes source files (.bdm files) to be loaded into the positioner drive. Its main interest lies in the fact that the source program, once saved in the drive, cannot be lost: the user can, therefore, easily modify the application if he needs to, without having to call on an external back-up. Maintenance will therefore be easier.
<i>Compact source files</i>	This option allows the user to compact source files before they are loaded into the positioner drive; hence, a gain in memory space. This option is of little interest for ordinary usage.

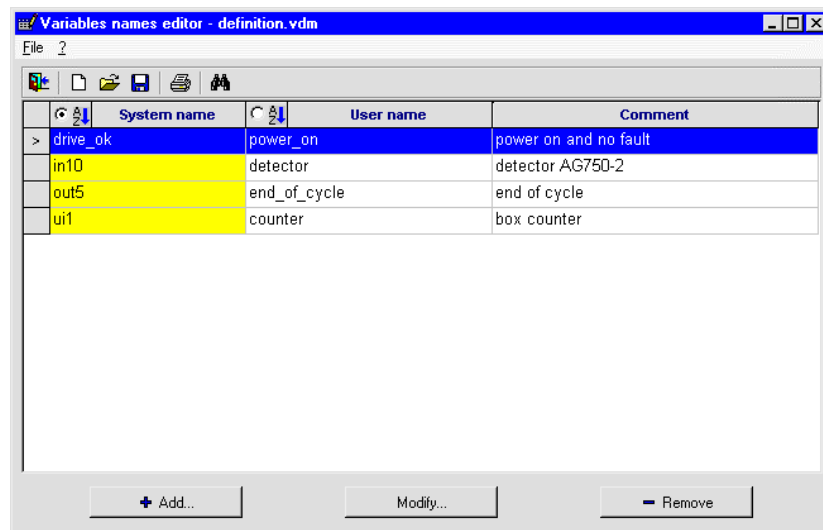
Example of display when an error is detected during compilation:



The error place and nature are clearly shown. In this example, there is a syntax error at line13, the assignment indication = has been replaced by the indication +, the result, more than likely, of a typing error. The cursor points to the error.

7.2.5 Variable Name Editor

The following button is the one associated with this function:

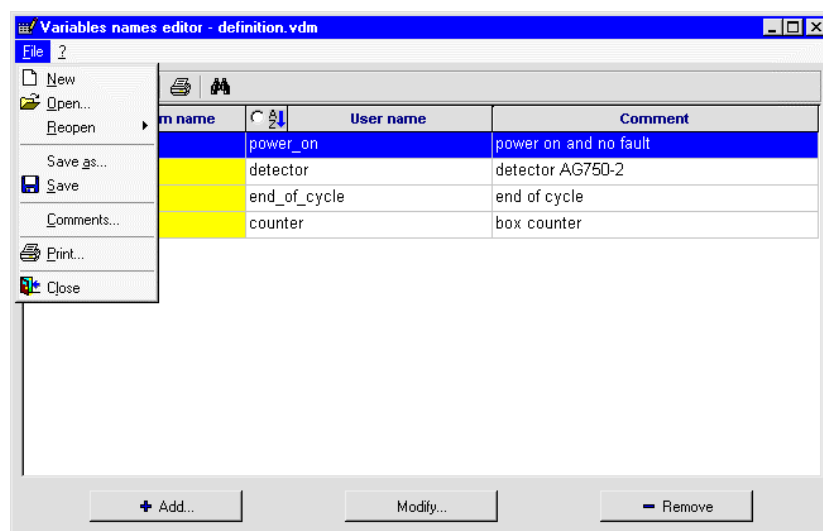


In the *Basic_DM* programs, it is possible to replace the names of the user and system variables with names that are more "graphic" in order to make programming more user-friendly.

For example, to increment a number of parts, we could program: `nb_parts = nb_parts + 1` instead of `ui1 = ui1 + 1`.

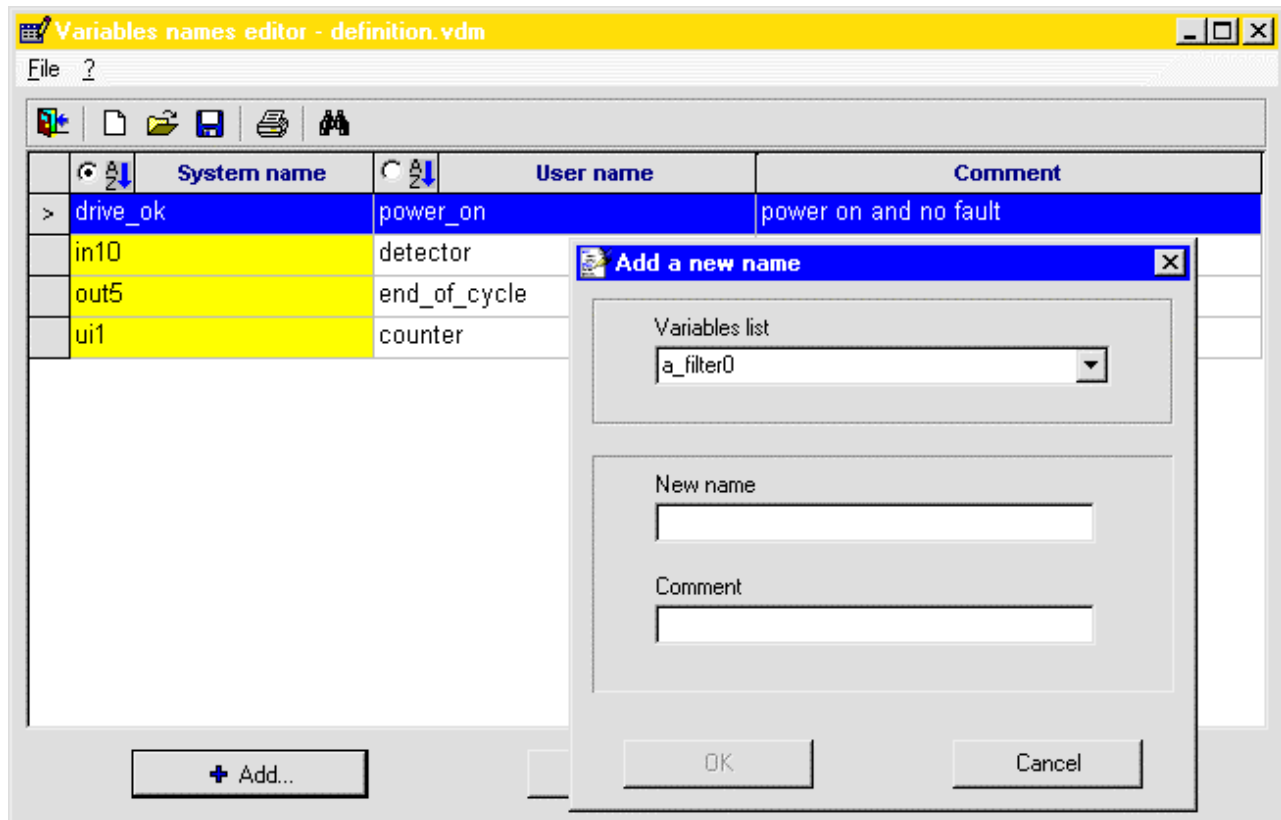
The variable names editor indicates the new names of the user and system variables to the compiler "in uncoded language". These declarations are stored in a `.vdm` extension file.

The file menu gives access to all tools that *open*, *save*, *print*, etc. a `.vdm` file. It is also possible to enter a *comment* concerning the whole file.



To add a new variable name:

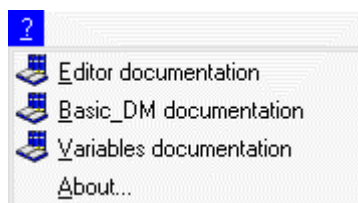
- click on the Add key,
- select the system variable from the drop-down list,
- enter the name "in uncoded language",
- then validate by clicking on the OK button.



It is also possible to change or remove a declaration by using the "Modify" and "Remove" keys.

the  button allows the user to sort names by alphabetical order.

7.2.6 About...



This menu gives access to:

- program editor documentation, the Basic_DM instruction guide and the directory of system variables (guides in Acrobat Reader PDF format)
- the About...window and displays the current software version number

7.3 Program execution

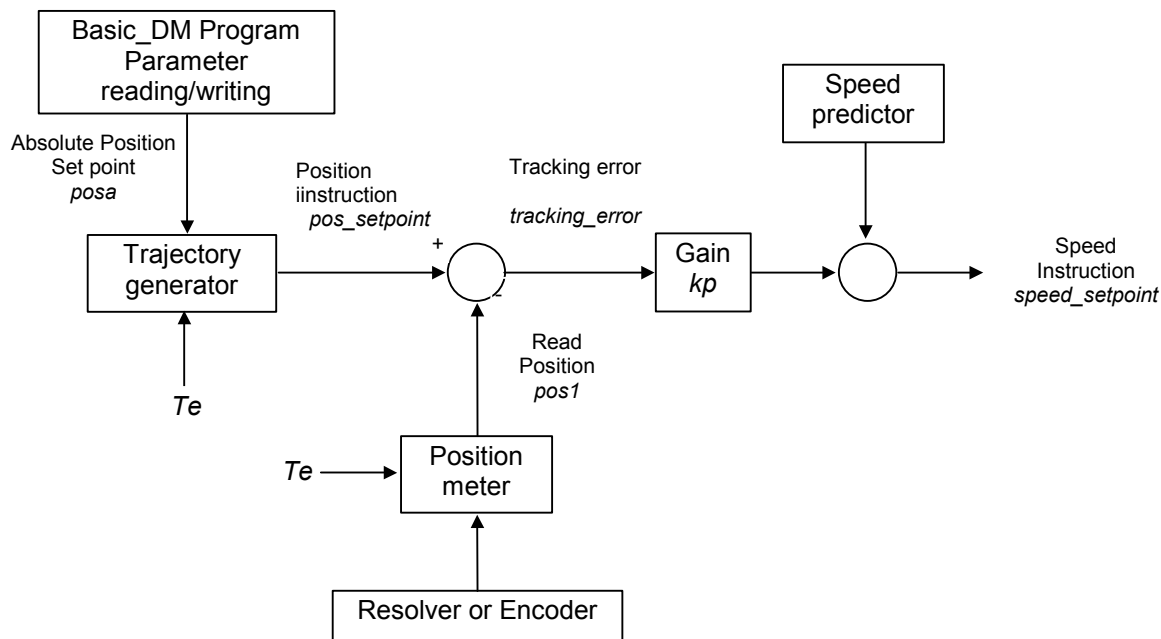
See DIGIVEX Motion "PVD 3517 - Programming Manual".

8. IMPLEMENTATION

The purpose of this section is to describe a simple way to implement an application that integrates a positioner drive.

8.1 Operating principles

8.1.1 Controlled position principle



The positioner drive has an internal clock which regulates the system. The sampling period is called the time frequency of this clock (250 μ s).

For each sampling period (Te), the positioner drive reads the contents of the pulse meter giving the position of the controlled axis (actual position $pos1$) and up-dates the trajectory generator's position instruction (position to be reached based on movement in progress $pos\_setpoint$).

An algorithm is incorporated in the trajectory generator. This allows the trajectory to be worked out whilst respecting specified speeds and accelerations (absolute position set point pos_a , speed $speed\_prog$, acceleration $accel\_prog$).

Position control is carried out by comparing the immediate instruction and the measurement of the actual position. The position difference existing between the measurement ($pos1$) and the instruction ($pos\_setpoint$) is known as the tracking error ($tracking\_error$). This error is then multiplied by a gain (kp) to generate the speed instruction ($speed\_setpoint$).

The positioner drive has speed (kff_speed1) and acceleration (kff_accel1) predictors. They allow tracking error to be considerably reduced:

Without predictor: Tracking error = Speed / Gain

With predictors: Tracking error $\rightarrow$ 0

8.1.2 Operating modes

The positioner drive has three main operating modes:

- Program execution: the positioner drive, gradually, carries out positioning (absolute or relative movement, home setting, master/slave synchronization, etc.), calculations, tests and output activation in accordance with the instructions of a program written in Basic_DM language (this is the most usual operating mode).
- Remote control using parameter access messages (CANopen SDO messages or PROFIBUS PPO messages).
- Remote control using process data access messages (cyclical CANopen PDO messages or PROFIBUS Standard Telegram messages).

All three operating modes can be used simultaneously.

8.1.3 User programs

These program are compiled.

The Basic_DM programming language provides the means for structuring programs into distinct tasks:

- main program and related subroutines (running process and movement control)
- priority subroutines (acknowledgement of a logic input on an interrupt signal edge)
- PLC function tasks (sequential PLC control using logic inputs and outputs)
- cyclical PLC function tasks (control of tasks that must be executed cyclically)

8.2 Preliminary Operations

8.2.1 Inputs/Outputs

- It is imperative that the default relay contact of the positioner drive (*contact OK*) be wired into the safety chain of the electrical cabinet (so that the power automatically cuts out if the positioner drive goes into major fault).
- Machines with finite limits, must have maximum running limits that are wired into the safety chain of the electrical cabinet. Any overrun of these maximum running limits will then cause the power to cut out.
- Machines with finite limits, must have hardware limits (placed in front of the maximum running limits) that are connected to the positioner drive (*in11 hardp_input* and *in12 hardm_input* inputs). These running limits define the zone in which the positioner drive is authorized to work. Any overrun of these running limits will not cause the power to cut out so that a clearance is possible (the maximum running limit / hardware limit distance should be sufficient for braking).
- Axes with obligatory home setting (axes having finite limits) must have a home switch (connection to the *in13 switch0_input* input of the positioner drive).
- The *in14* input (*move_en*) of the positioner drive can be used for authorizing movement or not.
- The *in15* input (*exec_en*) of the positioner drive can be used for authorizing user program execution or not.
- Where a motor is fitted with a brake, the positioner drive (only DSM and DPM) controls the brake with no need of external automatic regulation.

8.2.2 Connections – Installing parameter setting software

- Connect all equipment as described in the installation manuals for the various devices (motors, drives, control units and relays, limits, inputs/outputs, etc ...).
- Connecting a PC to the communication bus via a CRS232, CIM03, RS232CAN interface module for CANopen or USBPRO, PCIPRO, PCMCIA, RS232PRO for PROFIBUS.
- Install the *PARVEX Motion Explorer* software program on this computer.
- Verify all connections.

8.3 Determining the Network Structure

- Launch the *PARVEX Motion Explorer* application.
- Double click on the *DIGIVEX Motion* icon
- In the *Network Management* window, set the PC communication interface parameters, and enter the network structure: create a new structure (use the *Create a New Structure* and *Adding an Item* buttons) or use an existing network structure (use the *Open an Existing Structure* button). Show all the appliances belonging to the application on the diagram
- Check that the subscriber numbers entered match those set on the appliances that will be physically present in the communication network.
- Save the network structure to file (*Save Structure* button).
- Energize all the positioner drives in the communication network via their auxiliary power supply (Do not activate power)
- For DIGIVEX CANopen, check that the CRS232 or CIM03 interface module is energized: 5V green LED on.
- In the *Network Management* window, find the network structure (use the *Find Network Structure* button): check that all the objects present (and energized) have been found. A cross on a link indicates an object is missing.

8.4 Loading Parameters

- Check that the auxiliary supply to all the positioner drives in the communication network is energized (Do not activate power).
- For DIGIVEX CANopen, check that the CRS232 or CIM03 interface module is energized: 5V green LED on
- Look in the *Network Management* environment corresponding to the application, for the network structure (if it has not already been done), then click on the picture of the positioner drive in which the parameters are to be loaded.
- Select the *Servoamplifier Parameter Setting Tool*.
- Complete the various pages.
- Save the data to file (.pdm file).
- Select the *Connection* menu.
- Check the *On line* message is displayed at the bottom left of the window.
- Select the *File / Global Transfer* menu.
- Indicate the name of the file to be transferred (.pdm file).
- Validate and wait until transfer is completed.
- When transfer is completed, answer *yes* to the prompt *Save to EEPROM?*
- Check that the parameter values displayed on screen match the parameters previously saved in the .pdm file.
- Close the *Servoamplifier Parameter Setting Tool*.
- Repeat the procedure for the other servoamplifier positioners.

8.5 Actual Commissioning

- Check that the auxiliary supply to all the positioner drives in the communication network is energized (Do not activate power)
- For DIGIVEX CANopen, check that the CRS232 or CIM03 interface module is energized: 5V green LED on
- Look in the *Network Management* environment corresponding to the application, for the network structure (if it has not already been done), then click on the picture of the positioner drive to be commissioned.
- Select the *Variable Observation Tool* and *Servoamplifier Parameter Setting Tool* (in this tool select the *Inputs/Outputs* button).
- Use the forcing options available to check the logical and analog input/output connections (*force*, *forcing value*).
- Check the safety devices and limit switches are operating.
- Turn on the power to the first resolver to be commissioned (only do this one).
- Authorize torque (*torque_cmd* = 1) and movement (*move_en* = 1); the motor must remain stationary.
- If the motor has a brake, check the brake is operating correctly.
- If the motor vibrates or makes a lot of noise, work through the servocontrol settings again: *Servocontrol Settings* button, *Setting Calculation* tab.
- Use the *Stimuli Generator Tool* and *Oscilloscope Tool* and then check the quality of the motion requested (fine tune the servocontrol settings if necessary).
- Use the *Diagnostic Assistance Tool* in the event of a problem, to check the positioner drive for a fault. If the axis does not move, check that torque is authorized (*torque_on* = 1) and that the authorization to move is validated (*move_on* = 1).
- Once all adjustments have been carried out, save any possible changes in the .pdm file (*Setting Drive Parameters Tool*, *Save* button) and in the positioner drive (*SAVE* button or *EEPROM / Save in EEPROM* menu), then switch the power off.
- Close the *Servoamplifier Parameter Setting Tool*, *Stimuli Generator Tool*, *Oscilloscope Tool* and *Fault-Finding Tool*.
- Repeat the procedure for the other servoamplifier positioners.

8.6 Loading a trial program

- Check that the auxiliary supply to all the positioner drives in the communication network is energized (Do not activate power)
- For DIGIVEX CANopen, check that the CRS232 or CIM03 interface module is energized: 5V green LED on
- Look in the *Network Management* environment corresponding to the application, for the network structure (if it has not already been done), then click on the picture of the positioner drive in which a program is to be loaded.
- Select the *Program Editor*.
- Create a single program with the *New* button or open an existing program (.bdm file) using the *Open* button.
- Compile the program (*Compile file* button): an object file is then created (.odm file).
- Select the *Connection* menu.
- Check the *On line* message is displayed at the bottom left of the window.
- Select the *File / Transfer object file* menu.
- Indicate the name of the file to be transferred (.odm file).
- Validate and wait until transfer is completed.
- For the program just loaded to be acknowledged, select the *File / Apply programs* menu.
- Turn on the power to the resolver in which the program is loaded (only do this one so as not to be hampered by other axes).
- Validate program execution (*exec_en* = 1).
- Check that the program is running correctly. Execution Management Tool (Debug) follows the evolution.
- The loaded program should allow you, among other things, to:
 - check the origin setting cycle works correctly,
 - check motions executed match motions requested,
 - check software limit switch operation.
- Close the *Program Editor*.
- De-activate power.
- Repeat the process for the other servoamplifier positioners.

8.7 Loading user programs

- Check that the auxiliary supply to all the positioner drives in the communication network is energized (Do not activate power)
- For DIGIVEX CANopen, check that the CRS232 or CIM03 interface module is energized: 5V green LED on
- Look in the *Network Management* environment corresponding to the application, for the network structure (if it has not already been done), then click on the picture of the positioner drive in which a program is to be loaded
- Select *Program Editor*
- Create a user program by using the *New* button or open the user program to be transferred (.bdm file) by using the *Open* button
- Compile this program (*Compile file* button): an object file is then created (.odm file)
- Momentarily invalidate program execution (*exec_en* = 0)
- Select the *Connection* menu
- Check that the *On line* message is displayed in the bottom left-hand corner of the window
- Select the *File / Transfer object file* menu
- Show the file name to be transferred (.odm file)
- Validate and wait for the transfer to be completed
- Select the *File / Apply program* menu in order that the program which has just been loaded is properly acknowledged,
- Revalidate program execution (*exec_en* = 1)

8.8 Starting up the Machine

Apply the start-up procedure defined by the machine manufacturer or integrator.

As a general rule, the order for starting up is as follows:

- energize the peripheral devices (plc, PC, etc.) and auxiliary items (input/output supplies, communication bus supply, relays, brakes, etc.);
- energize the auxiliary supply to the servoamplifier positioners (low-level supply);
- energize the power devices (servoamplifier positioners).

When the servoamplifier positioner auxiliary supply is energized, the positioners display the figure 0 on the front panel (7-segment display: flashing 0 if no user program is running, steady 0 if user program is running).

When the servoamplifier positioner power supply is activated, the positioners display the figure 1 on the front panel (7-segment display: flashing 1 if no user program is running, steady 1 if user program is running). Any other display indicates a fault status (use the *Fault-Finding Tool* to identify the fault).

8.9 Shutting down the Machine

Apply the shut-down procedure defined by the machine manufacturer or integrator.

As a general rule, the order for shutting down is as follows:

- stop motion and execution of user programs
- de-energize the power devices (servoamplifier positioners)
- de-energize the servoamplifier positioner auxiliary supply (low-level supply)
- de-energize the peripheral devices (plc, PC, etc.) and auxiliary items (input/output supplies, communication bus supply, relays, brakes, etc.).

When the servoamplifier positioner power supply is de-energized, the positioners display the figure 0 on the front panel (7-segment display: flashing 0 if no user program is running, steady 0 if user program is running).

8.10 Re-setting the Machine

When the servoamplifier positioner power supply is cut intentionally, there is no specific sequence for restarting or clearing.

When the servoamplifier positioner power supply is cut unintentionally, apart from a mains failure, check that this is not due to a fault with one of the servoamplifier positioners (check the servoamplifier positioner front panel 7-segment display status or use the *Fault-Finding Tool*). Determine the possible nature of the fault, correct it and carry out a clearance: *reset_cmd* = 1 (*Variable Watcher Tool*), *Fault Clearance* button (*Diagnostic Assistance Tool*) or press the *RESET* button on the front panel of the positioner drive.